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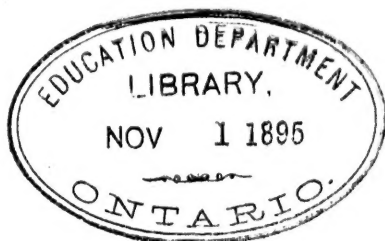
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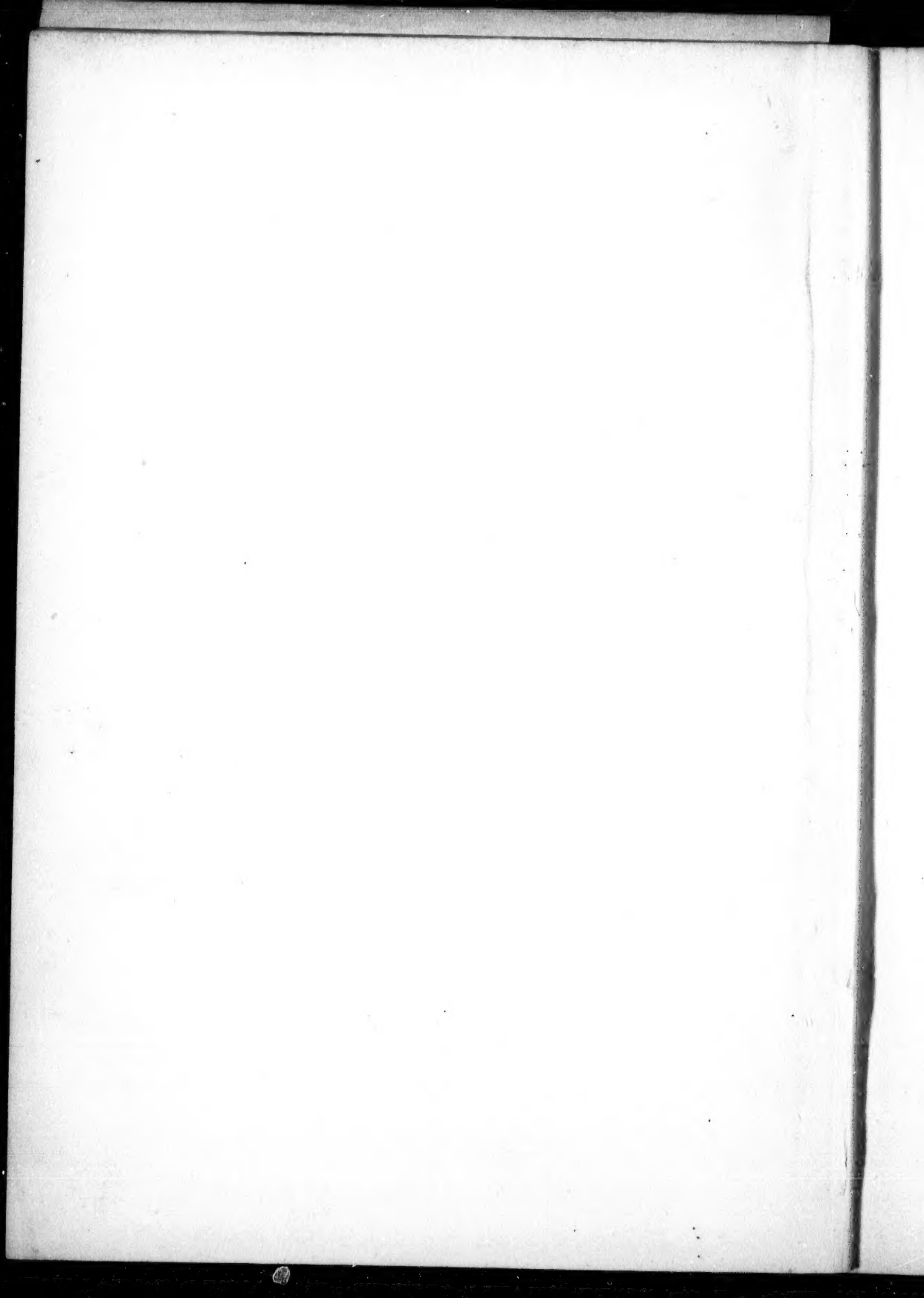
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BRITISH ASSOCIATION FOR
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CANADIAN ECONOMICS.



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BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

MONTREAL MEETING, 1884.

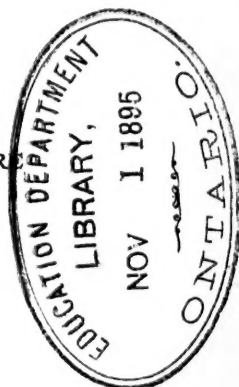
CANADIAN ECONOMICS

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PAPERS PREPARED FOR READING BEFORE
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WITH AN

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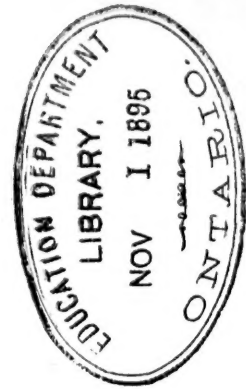
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Par PAUL DE CAZES, Bureau de l'Éducation, Québec.

NOTE.—Of the foregoing papers, No. I was read before Section G (Mechanical Science), Nos. XII, XIII, XIV and XV before Section C (Geology), while Nos. XXV, XXVI and XXVII were not prepared in time to be read before the Association. Dr. W. H. Hingston's paper entitled "The Climate of Canada and its Relation to Life and Health," which was read before the Physiological department of Section D (Biology), has been published as a separate volume (pp. 266) by Dawson Brothers under the above title.

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INTRODUCTORY REPORT.

A.

PRELIMINARY ARRANGEMENTS IN ENGLAND.*

The first definite expression, known to me, of a desire to hold one of the meetings of the British Association in Canada, occurred at York in 1881, when, at the final meeting of the General Committee, Captain Bedford Pim gave notice that, at the Southampton Meeting next year, he would move "that the British Association do meet in Canada in 1885."

On March 7th, 1882, a letter, written by the Marquis of Lorne, then Governor-General of Canada, and addressed to the late Mr. W. Spottiswoode, President of the Royal Society of London, was brought by him before the Council of the British Association. In this letter, a desire was expressed that the Association should hold its meeting in Canada during the year 1883. By the Council of the Association, the matter was referred to a committee for consideration, and at the next meeting (on March 27th) the following Report was presented and adopted:—"That as the place of meeting for the Association has been fixed by the General Committee for the year 1883, this Committee considers itself precluded from reopening the question, as suggested in the above letter. The question of a meeting at some future time in Canada will be brought before the General Committee at Southampton, in accordance with a notice given at York; but having regard to the letter of the Marquis of Lorne, and to the fact that an Association is likely to be founded in Canada during his tenure of

* Contributed by Professor T. G. Bonney, Secretary of the British Association.

office, they suggest to the Council the desirability of considering whether it would not be possible to send a deputation (which might be selected, say, from the permanent members of the General Committee) in case a meeting of the Canadian Association were held in 1883." A letter was written to the Marquis of Lorne, communicating to him the purport of this Report.

Difficulties, however, subsequently arose in relation to meeting at Oxford; and, in the latter part of the summer of 1882, it became evident that the intention of holding the meeting of 1883 in that town could not be realized. The following is an extract from the Report of the Council, presented at Southampton, with reference to the suggested visit to Canada and the arrangements for Oxford:—"An invitation to visit Canada in 1883, warmly supported by His Excellency the Governor-General, was received at the end of last year, but the Council were obliged to reply that the vote of the General Committee at York, accepting the invitation to Oxford, precluded them from entertaining the question for that year. With reference, however, to the meeting for 1883, the Council regret to inform the General Committee that unforeseen difficulties have recently obliged their intended hosts at Oxford to express a desire that the proposed visit of the Association should be for a time postponed."

In the summer of 1882, the officers of the British Association learned that an invitation to Montreal would be sent for 1884. They accordingly thought it advisable to endeavour to obtain some idea of the feelings of the General Committee as a body with reference to so important and novel a proceeding as holding a meeting outside the limits of the United Kingdom. Accordingly, on August 16th, a circular was issued to the members of the General Committee, requesting them, in view of an invitation having been received to visit Canada, to state whether they would be able to avail themselves of the invitation. The General Committee consisted at that time of about 700 members. By August 28th, 230 replies had been received; of these seventy-four were affirmative, eight, however, with limitations. In the negative were 156; of these ninety-six were absolute, a few being strongly expressed, while sixty were with limitations, many of them being only for the year 1883. It may

be added that the view of the officers was that it would be imprudent to accept an invitation for 1883, so much preliminary organization being requisite.

At the meeting of the General Committee held at Southampton on August 28th, 1882, the above mentioned motion by Capt. Bedford Pim was discussed, the date by permission of the meeting being altered from 1885 to 1883. This was seconded by Sir R. Temple, and supported by Mr. Colmer, representing the High Commissioner for the Dominion of Canada. Invitations for the year 1883 from Birmingham and Southport were also presented to the General Committee. After much discussion, a vote was taken which resulted in a decision to accept the invitation to Southport for the year 1883. The Committee then proceeded to consider the question of the place of meeting for 1884. Invitations were presented from Aberdeen, Birmingham, and Nottingham as well as from Montreal; after a vote had been taken, the invitation from Montreal was accepted.

Much doubt, however, continued to be felt as to the propriety of holding a meeting beyond the limits of the United Kingdom; and a memorial influentially signed was presented to the Council, in which the legality of the decision pronounced at the Southampton Meeting was questioned, and the Council were requested to convene a meeting of the General Committee to reconsider the matter. This memorial was laid before the Council on February 3rd, 1883, and, after consideration, the officers were instructed to inform the memorialists that, "as the decision of the General Committee at Southampton appeared not to be in contravention of the laws of the Association, the Council did not consider themselves empowered to summon a meeting of that body to reconsider the question; but that, as requested by the memorialists, they were taking steps which would enable them (very shortly, as they hoped) to ascertain the general feeling of the members of the Association with regard to the proposed visit."

The meaning of the latter part of this minute was that, at the above named date, the Council had no facts before them (beyond the materials afforded by the circular mentioned above) to serve as the basis of a computation of the number of members who were likely to visit Montreal in 1884, and if it had proved impossible to secure an attendance sufficient to render the meeting

there a representative one, not only numerically but also scientifically, it would have become the duty of the Council to recommend the General Committee to withdraw from the invitation.

Accordingly, after one or two personal interviews between the officers of the Association and the High Commissioner for the Dominion of Canada, a letter was addressed by the officers to the High Commissioner asking for definite information as to what the probable cost of a visit to Canada would be to ordinary members of the Association, as well as in regard to the number of persons to whom it would be possible to offer facilities for the visit. On receipt of Sir A. T. Galt's reply, his letter and a printed circular were forwarded to every member on the books of the British Association, requesting from each a definite statement, whether it was his intention to avail himself of the invitation to visit Montreal.

The Council were by these means enabled to present to the General Committee at Southport, September 19th, 1883, a report containing the results of the replies to the above named circular. These were such as to remove all doubt as to the representative character of the Montreal Meeting,—445 persons having notified their intention of being present, while fifty-five others had either become, or expressed their wish to become, members, with the view of taking part in the meeting.

The Council accordingly were of opinion that, as there was likely to be so representative a gathering of British members at Montreal, and inasmuch as 154 members of the General Committee had signified their intention of being present, little alteration would be necessary in the custom, and no changes need be proposed in the written law of the Association.

Although a committee had been appointed on March 6th, 1883, and had held some meetings, it was found on experience that so great an interest in the coming meeting had been already awakened, that it was needless to make an appeal to the representatives of English science through the individual efforts of its members; while the committee proved to be too large a body for the convenient discussion of the details of arrangements. Accordingly at a second meeting of Council, held at Southampton on September 24th, the Secretary read a memorandum in which he sketched the main outline of the arrangements

which he should propose in anticipation of the Montreal Meeting, and expressed an earnest desire that, if these were approved in principle, all details should be left to the officers. Another point was also discussed on this occasion, viz., that, in view of the generous offers made by those who spoke for the people of Canada, there was danger lest some persons, regardless of science but anxious to obtain a pleasant journey at a comparatively small expense, should make use of membership of the Association for this purpose. The Council accordingly passed resolutions, leaving the details of the arrangements for the Montreal Meeting in the hands of the General Officers, and restricting the election of new members after the termination of the month, until further notice, to election by special resolution of the Council,—thereby reviving for a time a power which existed in the rules of the Association, but which had fallen into abeyance.*

The meeting at Southport was attended by Sir Charles Tupper (who had succeeded Sir A. T. Galt as High Commissioner for the Dominion of Canada), and by Principal (now Sir William) Dawson, and at the meeting of the General Committee held September 24th, it was finally agreed that the meeting at Montreal should commence on August 27th, 1884, with Professor Lord Rayleigh as President. The following were elected Vice-Presidents (subject to their willingness to serve):—

The Marquis of Lansdowne,
The Marquis of Lorne,
Sir John A. Macdonald,
Sir Charles Tupper,
Sir Alexander T. Galt,
Sir Antoine A. Dorion,
Sir J. William Dawson,

The Hon. P. J. O. Chauveau,
Dr. W. H. Hingston,
Mr. T. Sterry Hunt,
Professor Huxley,
Professor Frankland,
Sir William Siemens,
Sir Lyon Playfair.†

* [This restriction in the matter of new members was not prompted by the Montreal Committee. Many persons, who failed to be elected in England, came out without vouchers and presented themselves for enrolment at the Committee's offices and in the reception room. By resolution of the Council, each life and annual member was allowed to qualify two members of his family as Associates, which entitled them to receive, like regular members, vouchers of identity and travelling certificates. The total number of transatlantic visitors who registered their names at the rooms thus amounted to 910.]

† [Of the above list, the Marquis of Lorne, Sir A. T. Galt, Sir Charles Tupper, and Professor Huxley were unable to serve, and the death of Sir William Siemens further diminished the list. The Council then nominated Sir Joseph D. Hooker, who acceded to their request, but was ultimately prevented from coming to Montreal by illness in his family.]

At the concluding meeting of the General Committee at Southport, on September 26th, Capt. Bedford Pim gave notice that he should move at the next meeting of the General Committee: "That the members of the Standing Committee of the American Association for the Advancement of Science be cordially invited to become Honorary Members of this Association during the meeting at Montreal." This resolution could not (in accordance with the rules) obtain the consent of the General Committee until the first day of the Montreal Meeting, when it would have been too late to issue invitations. The subject of the resolution was, however, within the powers of the Council, if not of the officers alone. The latter accordingly brought the question under the consideration of Council with the result that it was decided to invite, not only the Standing Committee, but also the Fellows of the American Association, to visit Montreal on the footing of Honorary Members.

The remainder of the year 1883, and the earlier months of 1884, were spent in preparations for the coming meeting, such as the selection of presidents and other officers of sections, of the evening lecturers, the election of new members, and other necessary preliminaries.

Two circulars were issued upon February 29th, 1884, — one but slightly modified from that usually forwarded to members, and extending the privileges of the Association to the American Association as well as to all Scientific Societies publishing Transactions; the other, containing instructions and information in regard to lines of steamships, railways and excursions, hotel rates, etc., as well as a blank form to be filled up by those intending to be present at the meeting in Montreal. Upon return of these forms, vouchers of identity in proof of membership were issued to applicants; and those sent to members elected before the close of the Southampton Meeting were stamped as entitling the holders to a reduction of £8, as a share of the Canadian subsidy estimated on the basis of 350 applicants. Free passes had also been provided from the same subsidy for the various officials of the Association by agreement with the Montreal Committee. It was also found needful by that body to supply to each European member a travelling certificate of identity, which was duly forwarded from the London office with a letter of directions regarding its safe custody and use.

In the earlier part of the summer, the Council were informed of the arrangements with regard to free ocean-telegraphy. As the London office of the Association had to be wholly closed from August 6th until late in September, Messrs. Thos. Cook and Sons kindly undertook to receive and transmit cablegrams from members in Canada to their families in Britain, or *vice versa*. Late in the month of July, a circular announcing these arrangements, together with a code for abbreviating cable messages, was forwarded to those members who had announced their intention of visiting Montreal.

The following extract from the Report of the Council, presented to the General Committee at Montreal on August 27th, sums up the more important details preliminary to the meeting :—

“The present meeting of the British Association, the fifty-fourth in number, is likely to be long memorable in its annals, as the first held beyond the limits of the United Kingdom. It marks a new point of departure, and one probably never contemplated by the founders of the Association, although not forbidden by the laws which they drew up. The experiment was doubtless a hazardous one, but it seems likely to be justified by success; and it may be hoped that the vigour and vitality gained by new experience may ultimately compensate for the absence from this meeting of not a few familiar faces among the older members; there will, however, be as large a gathering of members of more than one year's standing as is usual at a successful meeting in Great Britain, and the efforts which have been made by our hosts to facilitate the coming of members, and render their stay in Canada both pleasant and instructive, call for the warmest acknowledgment.

“The inducements offered to undertake the journey were indeed so great that the Council felt that it would be necessary to place some restriction upon the election of new members, which for many years past, though not unchecked in theory, has been almost a matter of course in practice. Obviously these offers of the Canadian hosts of the British Association were made to its members, not to those on whom they might operate as an inducement to be enrolled amongst its members. The Council, therefore, before the close of the Southport Meeting, published the following resolution :—‘That after the termination of the

present month (September, 1883), until further notice, new members be only elected by special resolution of the Council.' Applications for admission under these terms were very numerous, and were carefully sifted by the Council. Still, although the Council, as time progressed and the number augmented, increased the stringency of their requirements, it became evident that the newly-elected members would soon assume an unduly large proportion to those of older standing; so that, on May 6th, after electing 130 members under this rule, it was resolved to make no more elections until the commencement of the Montreal Meeting, when it would be safe to revert to the usual practice.

"The details of the arrangements made for the journey have already been communicated to the members, so that it is needless to make any further special reference to them; but the Council have to acknowledge the great liberality of the Associated Cable Companies in granting, under certain restrictions, free ocean-telegraphy to the members of the Association during the meeting.

"The death of Sir William Siemens has deprived the Association of one of its most earnest supporters and friends. It was during his presidency at Southampton that the invitation to Montreal was accepted, and he was appointed at Southport a Vice-President for this meeting. The Council nominated Sir Joseph Dalton Hooker a Vice-President, but he was unfortunately obliged, for domestic reasons, to resign the nomination in the early part of the summer.

"It has been the custom at meetings of the Association to invite the attendance of distinguished men of science from all parts of the world; but the Council considered that on the present occasion it would be well to offer a special welcome to the American Association (of which also several eminent Canadian men of science are members); they have accordingly issued an invitation to the Standing Committee and Fellows of that Association to attend the meeting at Montreal on the footing of Honorary Members."

B.

PRELIMINARY ARRANGEMENTS AND MEETING
IN CANADA.

Though many Canadians have been members of the British Association, the idea of Canada's welcoming that distinguished body seems to have been first suggested by an Englishman, Captain Bedford Pim, whose notice to that effect was given to the gathering at York in 1881. During the autumn of the same year, Captain Pim had an opportunity of conferring with his friend and correspondent, the Right Rev. J. T. Lewis, Bishop of Ontario, on the occasion of a visit to London, when the latter undertook to bring the subject of a Canadian meeting prominently before the members of the Dominion Government, with the view of obtaining their support and co-operation.

The First Minister, together with the leading members of his Cabinet, took up the subject with hearty good will and gave to the Bishop of Ontario the following official communication for transmission to England:—

“PARLIAMENT BUILDINGS,

“OTTAWA, January 9, 1882.

“MY DEAR LORD,—I am delighted to learn from your note of the 7th that there is a chance of the British Association fixing their place of meeting for 1883 in Canada.

“They will be received with ‘all the honours’ by both Government and people, and so soon as it is known that the Association are to visit us, we shall ask Parliament to make an appropriation for the purpose of adding to the comfort of our visitors.

“I may say that I have mentioned the project to Mr. Stephen, the President of the Canadian Pacific Railway Company, who expects that the railway will be finished to the foot of the Rocky Mountains ere 1883.

"He authorises me to say that that Railway Company will gladly receive the members of the Association as their guests, and will put the railway at their disposal for a journey across the Continent.

"You are quite at liberty to communicate the contents of this note to Captain Bedford Pim.

"Believe me, yours very faithfully,

"JOHN A. MACDONALD.

"Right Rev. the Lord Bishop of Ontario."

The good will of the Government was afterwards shown in a more practical way. After a conference with Mr. White (the Chairman of the Montreal Citizens' Committee), the First Minister agreed that the sum of \$20,000 should be placed in the estimates for 1883-84, as a contribution towards the travelling expenses of the visiting members. Moreover, an additional grant of \$5,000 was subsequently made towards the general expenses of the Executive Committee.

The official letter from the Governor-General, the Marquis of Lorne, despatched early in 1882, giving an invitation from Canada, led to definite action being taken in England, and resulted in the vote at Southampton (August, 1882) to meet in Montreal in 1884.

This departure from precedent, as was natural, provoked much hostile criticism. *The Times*, making itself the spokesman of the prejudiced and unintelligent classes, declared, to the amusement of the better informed, that "the proposal to hold a meeting in Canada and not in any part of Great Britain is really a proposition to suspend the work of the Association for a year. The year 1884 is to be a blank;" a "glorified picnic of our chief scientific men" would be the result. The British scientists would be "the lions of a Canadian season." Canada cared for their position, but "for their science she cannot care, or cannot care much. . . . If they talk sense, they will be listened to. If they talk nonsense, they will be listened to all the same, and with the same degree of intelligent appreciation."

Meanwhile, the decision of the General Committee of the British Association was officially communicated to His Excellency

the Marquis of Lorne, through the office of the High Commissioner, in a letter, dated August 29th, and addressed to the Secretary of State; and on October 4th, the Mayor of Montreal was notified of this decision by letter from Sir Leonard Tilley, then acting for the State Secretary. This letter concluded with the hope "that steps may be taken, by the Corporation and citizens of Montreal, to give that body (*i. e.* the British Association) such a reception as will maintain the high credit of that city for hospitality." The letter was read in the City Council and referred to a committee with Aldermen Fairbairn and Rainville as Chairman and Secretary respectively; while a public meeting of citizens was convened by the Mayor for the Mechanics' Hall in response to a requisition, signed by many leading citizens.

At the meeting that followed, the Chair was taken by his Worship,—Sir A. T. Galt (then High Commissioner for Canada) being present. The business was introduced by Mr. White, and resolutions were passed which were subsequently (November 13th) communicated to the Secretary of the British Association, thanking them for the honor they had done the city in selecting it for their meeting in 1884, gladly accepting the position, and pledging the city to fulfil the obligations thereby entailed upon it. A large and influential Committee of Citizens was also named to make the necessary arrangements. After the termination of the public meeting, a committee meeting was held at which provisional sub-committees on Finance, Conveyance and Reception, were appointed, and sums of money were subscribed to meet the necessary expenses and towards the formation of a guarantee fund.

At a meeting of the Citizens' Committee held early in December, a letter from the Council of the Association was read requesting the Committee to nominate a number of gentlemen, resident in Montreal, to form the Local Executive Committee, with full powers, to act for and in name of the Association anterior to the opening of the meeting. Accordingly the Committee drew up a list of names for transmission to London where it was considered in Council on February 5th, the following resolutions being passed:—

"RESOLVED: That the gentlemen whose names are included in the list now presented, and who are not already members of the Association, be now elected Members."

"That the gentlemen whose names are included in the list, together with the Vice-Presidents and the Local Officers, be appointed a Local Executive Committee for conducting the arrangements of the meeting at Montreal, with power to add to their number.

"That the Local Executive Committee be authorised to elect Members and Associates for 1884 from persons resident on the continent of America."

The list of this Committee will be found on page x. Meeting on February 20th, it organized by electing Mr. Thomas Cramp (since deceased) as Chairman, and Mr. D. A. P. Watt as Secretary.

Upon December 22nd, a sub-committee was appointed for the purpose of furnishing full details of information as to expense, etc., in response to a demand from Professor Bonney, while Sir A. T. Galt was appointed to represent the committee in England, with Mr. Colmer as British Corresponding Secretary. (Sir A. T. Galt was, on his retirement from the office of High Commissioner, subsequently replaced by his successor in office, Sir Charles Tupper). In the course of the ensuing month (January 8th) additional provisional sub-committees were appointed on Hotels and Private Hospitality, while the Civic Committee before mentioned was requested to act in concert with and form part of the Citizens' Committee, the Council itself generously coming to the Committee's aid with a vote of \$5,000.

On September 24th, 1883, the General Committee of the British Association, in session at Southport, upon motion of Sir Charles Tupper, seconded by Principal Dawson, confirmed the decision of the previous year. This decision was conveyed by a communication from the latter, which was read to the Citizens' Committee in session, October 10th. A letter was also read to the Committee, dating from Minneapolis, and signed by Principal Dawson and Mr. T. Sterry Hunt, communicating the accord of the American Association with the Montreal Meeting of the British Association and their determination to hold their next year's meeting at Philadelphia on September 3rd, a date which would give time for the presence of the members of the British Association after the close of the Montreal Meeting.

In consequence of the discussion that followed these letters, and as it appeared that the general Citizens' Committee and the

provisional sub-committees were too large act efficiently, an organizing committee was appointed to report upon a subsequent occasion.

Accordingly, at a meeting of the Citizens' Committee, held January 11th, 1884, a report was submitted from the Committee on Organization, nominating special sub-committees upon Finance, Reception, Conveyance, Hospitality, Lodgings, Meeting-Rooms, and Printing,—the Chairman and Secretary of each of these Committees, together with the Chairman, Treasurer and Secretaries of the Citizens' Committee, and the Chairman and Secretary of the Civic and Local Executive Committees, being constituted a Citizens' Executive Committee, with full powers. It was recommended in the report, which was unanimously adopted, that these special committees should keep minutes, make periodical reports to the Executive Committee, form and submit estimates of the amounts of money required by each to carry on their work, etc. An additional sub-committee was also appointed to procure papers from Canadians on economical subjects to be read before Section F. This sub-committee was subsequently (January 16th) constituted a Special Committee on Canadian Economics. To this body Sir Henry Lefroy humorously alluded in a paper read before the Royal Colonial Institute in London:—"Of the precise function of the last section I am in doubt. There was little evidence of economy in any part of the programme."*

* It may interest Montrealers to know that the Montreal Meeting has been the occasion of a considerable amount of "literature." Sir Henry Lefroy's paper has been reprinted in pamphlet form. We shall have occasion to refer to Prof. Boyd Dawkins' letters contributed to the *Manchester Guardian*. Mr. Alfred Pegler's "Visit to Canada and the United States" originally appeared in the columns of the *Hampshire Independent*. The *Times* was represented from its American headquarters at Philadelphia. Mr. F. H. Thomas, the special correspondent of the *London Graphic*, accompanied the members of the British Association on their tour to the Rocky Mountains. This paper also devoted several pages of illustrations to the meeting and its celebrities; while the *Illustrated London News*, with the best intentions, engraved an old photograph of Dorchester Street, taken from the windows of the Windsor Hotel, as "Montreal, View looking east from Mount Royal." Not only the metropolitan but the provincial press of Great Britain was largely represented at the meeting, and delegates came from local Scientific Societies, such as Mr. R. D. Pullar, of Tayside, F.R.S.E., from the Perthshire Society of Natural Science, whose "Report on the British Association Meeting, Montreal," was printed in the *Perthshire Constitutional and Journal*. The *Western Daily Mercury* was represented by Mr. Isaac Latimer, the *Sheffield Independent* by M. J. D. Leader, the *Northern Echo* by Mr. J. F. Taylor, the *Edinburgh Scotsman* by Mr. H. Calder. All these journals printed from six to twenty communications upon the Meeting of the Association, and the sights and places which it was the occasion of their visiting. Numerous other newspapers were also represented.

The Citizens' Executive Committee forthwith organized, with Mr. Hugh McLennan as Chairman, and, having secured the services of Mr. J. D. Crawford as General Secretary, proceeded without delay to complete the arrangements necessary for the entertainment of the British Association. Bi-weekly meetings were held from January 12th to August 27th, in the Molsons Bank Chambers, 198 St. James Street. They also formed committees in the various cities and towns to be visited by the members of the Association. Arrangements were made for the preparation by Mr. S. E. Dawson, of a hand-book to Canada, to be distributed free among the members of the Association. A general circular was addressed to the citizens of Montreal, asking for their loyal co-operation with the Committee and pointing out the different ways in which assistance might be given:—

"First.—The citizens generally may individually become the hosts of members of the Association, receiving the visitors into their homes and entertaining them during their stay in Montreal. The Committee confidently expects that from five to six hundred persons will thus be cared for. In this connection it may be noted in passing that, by reason of the date of the meeting, some sacrifice of leisure and holiday will be required; Montreal ought not, at such a time, to show long rows of locked and inhospitable houses to influential guests from so great a distance.

"Secondly.—They may contribute to a Citizens' Fund for general expenses. This the Committee proposes to raise by contributions of fifty dollars and under, payable in cash; and by subscriptions of one hundred dollars and over, one half to be cash, and the balance to remain as a Guarantee Fund, at the call of the Finance Committee. A sum of not less than ten thousand dollars will be required in subscriptions from the Citizens to enable the Committee adequately to defray the expenses of the meeting.

"Thirdly.—They may become Members of the Association for the year, by paying into its treasury the sum of \$10 or \$5, which are the qualifications for annual and associate members respectively. A large proportion of the associate membership fund has always been derived from the fees of lady members. Knowing the importance attached to this fund by the Association, the Citizens' Committee undertook the following obligation respect-

ing membership, (quoted from the circular of November 8th, 1882)—‘It is believed that the British Association may count upon a large attendance of local Members and Associates, both from the Provinces of the Dominion and from the United States. In any case the Finance Committee are prepared to guarantee that the revenue from this source shall not fall below that ordinarily received by the Association.’ We ought, therefore, to procure for the Association not less than two thousand members for the year. It should be stated that the income of the Association is mainly expended in furthering original scientific research.”

The co-operation was secured of the various Railway and ocean and inland Steamship companies, of the Telegraph companies, of McGill University and its affiliated colleges, of the Natural History Society of Montreal, and of numerous other bodies, public and private. The Queen’s Hall was secured for the evening lectures and for the Presidential Address, and the Victoria Skating Rink for the reception to be tendered to the Association by the citizens. The Corporation of McGill University was not backward in offering a similar reception to the Association, and the example was followed by not a few private citizens of Montreal who opened their houses and grounds for afternoon receptions.

On August 6th, the Executive Committee was joined by Professor Bonney, stray members of the Association having already begun to present themselves at the rooms. The month of August witnessed the arrival of our guests in ever-increasing numbers,—those who desired to take their trip to the Rocky Mountains before, instead of after, the date of meeting being accommodated with the necessary passes. And so the time wore on till the arrival of the S.S. *Parisian*, carrying the Presidents and Secretaries of Sections. “This voyage,” writes Sir Henry Lefroy, “was an extra service which, under no circumstances, would have been thought of, but for the desire of the Messrs. Allan to provide suitable conveyance for the members of the Association. It was a sailing altogether beyond their mail contract, and I regret to add that the receipts fell far short of the expenditure.”

On August 27th, an address was read from the Mayor and Aldermen of Montreal, welcoming the Association to the city. On the evening of the same day a welcome from the Royal Society of

Canada was presented, and Lord Rayleigh delivered the Presidential Address in presence of His Excellency the Governor-General. In welcoming the British Association to Canada, the Marquis of Lansdowne took occasion to make the first public announcement of the honour of knighthood recently conferred by Her Majesty upon Principal Dawson.

The week that followed was by all accounts one of complete success. The different Sections were accommodated in the buildings grouped within easy distance of McGill College:—Section A in the Presbyterian College, Section C in the Redpath Museum, Sections B and D in the main body of McGill College, Section E in the Mansfield Street Gymnasium, Section F in the Synod Hall, Section G in the Congregational College, and Section H in the Wesleyan College.

The scientific work of the Association was varied by Saturday excursions to Quebec, to Ottawa, and to Lake Memphremagog, and at the close of the meeting to the Rocky Mountains. Of this expedition, for which free passes were provided for 300 members of the Association, Professor Boyd Dawkins wrote as follows to the *Manchester Guardian*: "The expedition has in every way been a complete success. It has been welcomed everywhere as an expression of the interest felt by the inhabitants of Great Britain in their kinsmen in the remote Northwest, and has been taken everywhere to be a new link binding the loyal Canadians to the mother country. To us who have been received with open arms and hearts everywhere, and who have been carried safely and luxuriously in Pullman cars and in steamers by the Canadian Pacific Railway Company from Montreal to the Rocky Mountains and back, some 5,720 miles, it has been an education and will be a life-long memory."

Meanwhile the Meeting in Montreal was brought to a close on September 3rd, the acting-treasurer, Sir Erasmus Ommaney communicating the following abstract of attendance:—

Old life members	235
New life members	20
Old annual members	318
New annual members	215
Associate members	825
Lady associate members	74
Foreign members	26
Honorary members	60
Total	1,773

Appropriations of money were made in aid of scientific inquiries, several being committed to Canadian scientists, while the Council made the following official recommendations:—

(1.) To call the attention of the Dominion Government to the absence of trustworthy information concerning the tides of the Gulf of St. Lawrence and the adjoining Atlantic coast, and to the dangers which thence arise to navigation.

(2.) To urge upon the Dominion Government the importance of obtaining accurate and systematic tidal observations, and of tabulating and reducing the results by the scientific methods elaborated by committees of the British Association.

(3.) To suggest the immediate establishment of a sufficient series of observing stations on the sea coasts of the Dominion.

One grant of £50 was made with the special object of promoting investigations into the habits and character of the Indian tribes of the Northwest, the section of Anthropology strongly recommending the Dominion Government to take the subject of British American Ethnology into special investigation, before it was too late, by founding a museum, and systematically preserving everything that might throw light upon the origin, customs, languages, and arts of the red man.

On the same occasion, announcement was made of the McGill University Medal Fund. During the meeting, it had occurred to some of the members that the foundation of a prize at the McGill University would be a fitting memorial of their visit, and an acknowledgement of the hospitality with which they had been received by the Dominion of Canada. The idea was warmly taken up and the sum of £550 was raised by private subscription among the members, a sum which has since been augmented by further subscriptions. This has been devoted to the founding of a yearly Exhibition for proficiency in Applied Science. Some steps were also taken with a view to the foundation of a Free Public Library in Montreal.

The proceedings were appropriately closed by Sir William Dawson's conferring the honorary degree of LL.D., in the name of McGill University, upon the officers of the Association present at the meeting, as well as upon Professors Asa Gray of Harvard, James Hall of Albany, and Daniel Wilson of Toronto.

Our account of what was done in Montreal would be incom-

plete without some allusion to the single sad event which marred the otherwise even course of the visit of the British scientists. On Thursday, September 4th, Mr. Walter Raleigh Browne died of typhoid fever in the General Hospital in this city. Mr. Browne was a graduate of Trinity College, Cambridge, and a prominent member of Section G, eminent in hydraulics and other engineering subjects. He was also a frequent contributor to the press on philological and philosophical topics, besides being active in philanthropic work.

We cannot more fitly close this record of the Montreal Meeting than by quoting the reference made to it by Sir Lyon Playfair in the opening of his Address as President to the Association at Aberdeen in September, 1885. "Our last Meeting at Montreal," he said, "was a notable event in the life of the British Association, and even marked a distinct epoch in the history of civilisation. . . . The inhabitants of Canada received us with open arms, and the science of the Dominion and that of the United Kingdom were welded. No doubt science, which is only a form of truth, is one in all lands, but still its unity of purpose and fulfilment received an important practical expression by our visit to Canada. This community of science will be continued by the fact that we have invited Sir William Dawson, of Montreal, to be our next president at Birmingham."

By the end of September the accounts of the Executive Committee were so far closed as to warrant the passage of a resolution releasing the contributors to the Guarantee Fund from all responsibility under it,—the money subscriptions from citizens (amounting to \$4,820), the civic contribution of \$5,000, and the parliamentary grant of \$5,000, having together proved more than sufficient to meet all the Committee's liabilities. At the same meeting, it was decided to carry out the intention intimated to the Chairman of Section E (Sir Richard Temple) and print the present volume as a recollection of an event which the citizens of Montreal will recall with pride. It was decided that the edition should consist of fifteen hundred copies and that a wide circulation should be given to it among those members of the Association who had visited Canada. Copies were also to be distributed among the leading public libraries in Europe, America, Australia, etc., and among the public institutions of the Dominion.

To see the volume through the press, the services of Mr. R. W. Boodle, as editor, were secured.

At the last meeting of the Citizens' Committee, held April 23rd, 1885, the final accounts duly audited were presented by the Executive Committee, and accepted by the former body. There remained, after all liabilities had been provided for, a surplus of \$1,500, and the recommendation of the Executive that this sum should be presented to McGill University in recognition of, and compensation for, their liberality in placing the buildings and grounds of the University at the disposal of the Association, rent free, was accepted. It was understood that the sum should be invested to form the nucleus of a British Association Apparatus Fund, the income from which should, from time to time, be used to buy philosophical apparatus. After transacting routine business, and passing the customary votes of thanks, the Committees were finally dissolved.

THE CITY AND CORPORATION OF MONTREAL.*

The city of Montreal was incorporated in 1832. It embraces an area of about 5,000 acres, divided into ten wards, each returning three members to the City Council. The Mayor is elected by the suffrages of the citizens generally; and the terms of office are one year for the Mayoralty, and three years for the Aldermen (one retiring annually). The population of the city proper is about 150,000.

The assessed value of its real estate approaches \$90,000,000, of which about \$15,000,000 is exempted from taxation under the following heads:

Government property.....	\$ 2,200,000
Corporation property.....	4,500,000
Benevolent Institutions—Roman Catholic.....	4,000 000
Do. Do. —All others.....	1,200 000
Churches and Parsonages—Roman Catholic.....	1,600,000
Do. Do. —All others.....	1,500,000
Total.....	\$15,000,000

The valuations are made annually by a board of assessors who visit every property for that purpose; and, while the law directs the appraisement to be made at the actual market value, it is generally conceded to average about ten per cent. under that ratio, so that the actual market value of real property may be set down in round figures at \$100,000,000.

The rate of annual assessment is one per cent. on value. There is an additional one fifth of one per cent. for School Tax, which is levied and collected by the city, but handed over for administration to the School Commissioners (a body appointed by the local Government and the city jointly).

In addition to this one and one fifth per cent. on Realty, there is a Water Rate, based on a sliding scale, which amounts to about seven and one half per cent. on annual rental values; and an assessment of seven and one half per cent. on the rental of all business premises which is known as the Business Tax; and also specific Licenses on certain businesses, and the usual taxes on horses, carriages, dogs, etc., which come under the head of Personal Taxes. The city also derives a considerable

* From notes furnished by Mr. Charles Robb, City Auditor.

revenue from the Markets, and from penalties imposed by the Recorder's Court. Drains and street improvements are made by special assessments, borne in whole or in part by the persons benefited.

The present revenue from all sources is about \$1,700,000, and as an illustration of the more recent progress of the city, the following comparative statement is given:—

	Gross Revenue.
1850.....	\$ 150,000
1855.....	225,000
1860.....	450,000
1865.....	600,000
1870.....	800,000
1875.....	1,325,000
1880.....	1,500,000

An analysis of the actual details of taxation is subjoined for the year 1880, showing Montreal to be a very lightly taxed city,—the sum of \$480,000, out of a revenue of one million and a half dollars, being all that its real property had to bear that year. The school tax represents (or should do so) a saving of a more than equivalent outlay for fees; the water rate is the supply of a household necessity which, if in the hands of a private corporation, such as the Gas Company, would not be regarded as a tax; the market rents are, so to speak, the interest on the city's investments; and so on:—

From Assessments of 1 per cent. on Realty.....	\$ 480,000
“ Do. for School Tax, one fifth per cent. on Realty.....	120,000
“ Business duty of 7½ per cent. on rentals of business premises, and special business licenses	150,000
“ Arrears of the above.....	205,000
“ Water rates and arrears of same.....	365,000
“ Market rents.....	80,000
“ Carters' licenses and dog tax	44,000
“ Recorder's Court.....	8,000
“ Private butchers' stalls.....	22,000
“ Innkeepers' licenses.....	6,000
“ Road Department permits.....	1,500
“ Ground rents.....	2,500
“ Miscellaneous (extraneous) items.....	5,500
“ Statute labour tax	150
“ Interest collected on arrears.....	24,350

Total revenue of the year 1880.....\$1,514,000

The annual appropriations for the administration of the city's affairs are based on the actual receipts of the preceding year, five per cent. being reserved for unforeseen expenditures. Provision for the interest and for a sinking fund on its funded debt is made, by law, a first charge on the revenue.

The debt of the city, after deducting the accumulations of Sinking Fund, is \$10,000,000, of which about \$8,000,000 is represented by *bona fide*

assets in the form of Water Works, Markets, Police and Fire Stations, City Hall, etc., which yield a revenue, directly or indirectly, equal to the interest on that portion of the debt, while of the remaining \$2,000,000, about one half was spent on Mount Royal Park and the balance on street improvements, drainage, etc.

The water works have cost up to the present date about \$3,000,000, and the present revenue is over \$450,000, which fully covers interest and cost of administration.

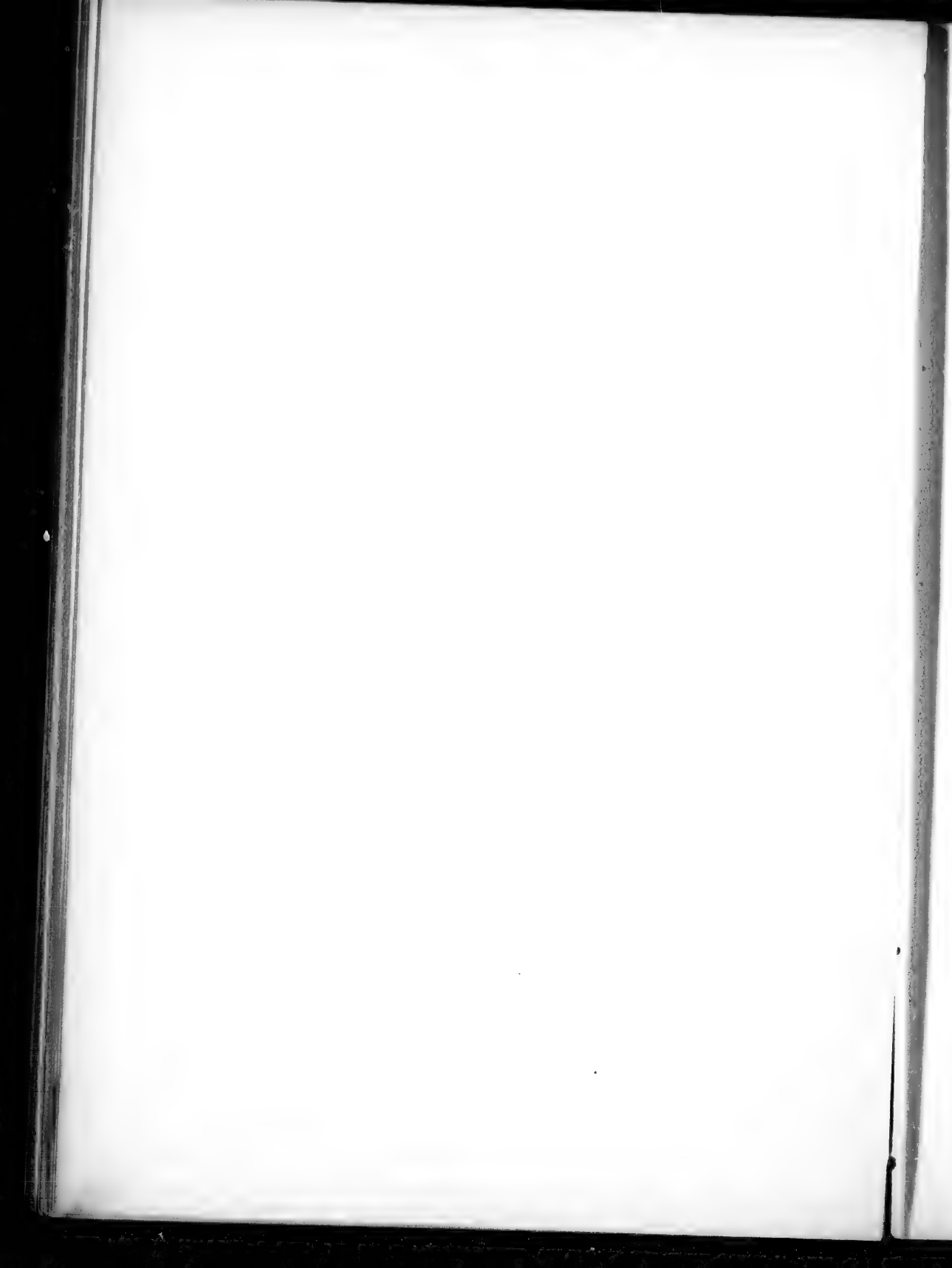
The credit of the city stands so high, that it had no difficulty in floating four per cent. securities at par last year, to redeem six per cent. debentures then maturing.

The harbour is a separate trust, administered by a Commission appointed by the Dominion Government and by certain trade organizations, with one representative elected by the City Council.

The trade of the harbour for the navigation season of 1883 was as follows :—

	VESSELS.	TONS.
Ocean Tonnage :—		
Steamships.....	464	605,805
Sailing vessels.....	196	58,458
Inland Tonnage.....	5,477	764,721
Total.....	6,137	1,428,984

The income of the trust was \$247,813.19.



INTRODUCTORY NOTE.

At the fifty-third meeting of the British Association for the Advancement of Science, held at Southport in 1883, it was resolved at a meeting of the committee of Section F, held on September 25th, that the president and secretaries of the section together with Mr. J. B. Martin should be appointed a committee with the view of procuring papers from Canadian authors, to be read before the section at the Montreal meeting. The following were the subjects suggested in the resolution:—Agriculture, education, fiscal policy and foreign trade, fisheries, immigration and population, pauperism and tariff.

When the purport of this resolution was communicated to the Montreal citizens' committee, it was resolved on January 11th, 1884, that a sub-committee should be appointed to procure statistical papers. On January 16th, this sub-committee was constituted a special committee on Canadian Economics, of which Mr. Hugh McLennan was named chairman, with Mr. Henry Budden as secretary. This committee having added some subjects to the list, such as mining, manufactures, banking and finance, forestry, conveyance by land and water, etc., requested its secretary to put himself in communication with experienced persons throughout the country for the purpose of procuring the papers on the subjects suggested.

Out of a large number received, certain papers were selected and sent to the committee of Section F, which, on September 3rd, passed the following resolution:—

"The Committee of Section F (Economic Science and Statistics) of the British Association for the Advancement of Science, have received the following* papers, which were prepared by special request for the Montreal meeting by Canadian and United States authors. The list of these papers is arranged according to the programme of subjects settled by the organizing Committee in England for the section at the Canadian meeting.

"The Committee have read with the greatest interest these valuable and instructive papers: they consider that the work of the section has been largely promoted by the North American contributions, which effectively illustrate the political economy of the Continent; and they learn with the utmost satisfaction that it is the intention of their Canadian friends to publish the essays.

"On behalf of the Committee,

"RICHARD TEMPLE,

"Chairman and President of the Section."

In justice to the writers of the following papers, as well as to secure a wider audience for their contributions to subjects of deep importance to all Canadians, it has been decided to issue the present volume.

MONTREAL, *December*, 1884.

* The list of papers subjoined is omitted. They will be found with some additional papers in the following pages.

CANADIAN ECONOMICS.

I.

COMPETITIVE LAND AND WATER TRANSPORT.

BY EDMUND WRAGGE AND ALAN MACDOUGALL.

In approaching the consideration of the comparative cost of land and water transport, a number of complex questions have to be dealt with which make it difficult to arrive at a proper or useful determination of the merits of the question. The data necessary may be said to be a country, or countries, in which a large competing traffic is carried on, all the year long, by land and water; and the presence of a number of commodities of daily life, the consumption of which is so great as to make public carriers enter into keen competition for the carrying trade,—commodities for example such as breadstuffs or coal. If we were to look into the home trade of Great Britain we might be able to find a considerable amount of competition in the coal-carrying trade by land and water, and we might also find other commodities upon which to base a comparison. But the area of the United Kingdom is really so limited in considering a question of such breadth as this, that the discussion would almost narrow itself to the limits of a local nature. The question of rates has from time to time come prominently before public notice in Great Britain, and a few years ago a Royal Commission was issued to inquire into the rates and fares of railways. Nothing of value bearing on the subject before us can be gleaned from the voluminous blue book which has been published.

On the continent of Europe we do not find any direct land and water competition such as exists in North America. Here we have a good field for our enquiry, the distances are so great, that, not only are there competitive points on the continent hundreds of miles apart, but there are points which directly influence markets at the distance of nearly one-half of the earth's circumference from each other. Here nature has showered its blessings on mankind by giving magnificent natural water routes for hundreds of miles, alongside of which the ingenuity of man has placed long and costly modes of land transport.

The great natural highway of the North American continent is its lakes, which are linked together by short rivers and one canal of twenty-seven miles in length. From this point the highway is prolonged to the ocean by a noble river, the navigation of which has been aided in a few places by a series of canals. This is generally known as the St. Lawrence route.

There is another celebrated route on the continent, which does not as yet present any important points of competitive interest,—the route by the River Mississippi to the Gulf of Mexico, and thence to the Eastern States or Europe. The improvement of the navigation of this splendid river has now received the fullest consideration from the cities on its banks. Works of great magnitude and engineering skill have been and are being carried out for the improvement of the channel. There are not as yet many points of comparison between this route and the St. Lawrence, or Erie Canal; still it is to the point to mention that the exports of New Orleans are increasing rapidly, and, if it cannot show exports of breadstuffs equal in magnitude to the least of the principal eastern ports, the growth of the shipments of southern-grown cotton is assuming proportions which will soon place the port in active rivalry with some of the more favored eastern ports. Should there ever be direct land and water competition, from the lower Mississippi, it will have to take the form of water from New Orleans, *versus* railways from St. Louis and New Orleans to some point like Baltimore or New York, or perhaps *versus* railways and steamboats to Liverpool.

The actual competition between land and water into which we propose to examine, is that which takes place on the northern chain of lakes; and the routes which enter into competition are:—

I—The Lakes from Chicago to Buffalo, combined with the Erie Canal, as the all water route, *versus* the various lines of railway communicating between Chicago and the seaboard at, say, New York.

II—The Canadian water route, which is common with the American to the east end of Lake Erie (the city of Buffalo) and from this point distinctive and competitive by the River St. Lawrence to Montreal, *versus* the Railway Routes from Chicago to Montreal.

I. THE AMERICAN ROUTE.

The principal point of competition on the continent, is the great and enterprising city of Chicago, situated on the western shores of Lake Michigan. It is the chief centre of the grain trade, and as grain is the great staple of the carrying trade of the continent, the following remarks will be directed to its carriage.

The head of navigation is Duluth at the west end of Lake Superior, 1,398 miles from Montreal. Chicago, on the west shores of Lake Michigan, is 836 miles from Montreal, which is the ocean port of Canada.* From Chicago *via* the lakes to Buffalo, at the east end of Lake Erie, is about 850 miles. Here the Erie Canal begins and extends through the state of New York, for a distance of 352 miles. There may be longer canals in Europe, but it is doubtful if there are any public works which have played a more important part in building up a country, or on which more anxious consideration has been expended than on this canal. We have here a highway of vast importance, at one time doing an immense carrying business, doomed in about half a century, to see its business pass away, and its whole usefulness become seriously impaired.

It was opened in 1825, and its importance was rapidly recognized. Its reconstruction was begun in 1836, nor was it completed till 1862. The depth of water is seven feet, the width of water surface seventy feet, while at the bottom the canal is fifty-two feet. It links the waters of Lake Erie and Buffalo to those of the River Hudson and Troy (in the state of New York),—a distance of 352 miles. Going east from Buffalo, there are only five

*The distance by the lakes from Chicago to Montreal is 1261 miles.

CANADIAN ECONOMICS.

locks, with a total lift of 44.70 feet. The greatest detention for lockages is at the city of Troy, where the lockage is continuous downwards for 173.28 feet.

The average size of the boats which navigate this canal is from 230 to 240 tons burden: the largest craft that can pass the locks is 250 tons and draws six feet of water. The boats are towed by horses or propelled by steamers; in the latter case, the system which finds most favor is the one known as the Illinois System, which consists of a steamer having a paddle-wheel at the stern, and a barge called the "consort," which is pushed in front in preference to being drawn.

The average time occupied by a barge drawn by horses in making the round trip from Buffalo to New York and return, is twenty-eight days: or about seven trips in the season. When propelled by a steamer the trip can be made in twenty-two days, *i.e.* nine trips in the season. A special trip was made in July, 1879, to determine the shortest time in which a barge could pass from Buffalo to New York. The water was very low at the time, there were several detentions from grounding, no special arrangements were made for pushing on the inspecting party, which consisted of the engineers, and they took their turn at all the locks in the ordinary way. The Illinois system was adopted, the steam-barge and consort carried a total load of 451 tons. The time occupied in making the single trip was nine days, fourteen and a half hours, which is nearly one-third less time than the average running time of horse-boats.

In its early days the Erie Canal was the chief means of transport through the state of New York, and was undoubtedly a prominent factor in the settlement and cultivation of the state. Its traffic returns were very great, and its supremacy complete. Since the construction of railways the returns have gradually fallen off, and the supremacy of the land carriage has asserted itself. As the canal was losing its monopoly its tolls were lowered, till at the present time the canal is free of all toll. Yet it cannot hold its own. The future of the canal has been carefully and anxiously considered by the official engineer of the state of New York, in his reports for the past four years. The great importance and necessity of deepening the canal one foot are strenuously advocated; it is urged that if a steamer and consort could be

built having a draught of seven feet of water, so that the boats could carry 600 tons, or about 20,000 bushels, this would cheapen the cost of the transport of wheat one cent a bushel.

Independently of railway competition, that of the Canadian canals was acknowledged, two years ago, to be so powerful and aggressive, that immediate action on the part of the Legislature is called for to save the Erie Canal! The plea is advanced that if it were free from tolls and deepened one foot, an extra trip could be made each year, and many barges which are forced to winter in New York could winter at home or in Buffalo, and the large boats could transport a bushel of wheat from Buffalo to New York at less than three cents, as it is assumed they could easily get return cargoes: and it is specially mentioned that this rate "is so low, that it would be difficult for any other route to successfully compete with it."

It was stated in an address delivered before the Chamber of Commerce of the city of New York about eleven years ago, that the New York state canals formed the only line of transportation of cereal products of the western states to the tide-water at New York, capable of competing with the Welland Canal and River St. Lawrence, and that a ship canal connecting the waters of the great lakes with the River Hudson was necessary to the continuance of the commercial supremacy of the city of New York.

The history of the past decade is a refutation of this argument and bears strong evidence to the aggressiveness of land transport. A comparison of the relative amounts carried by the Erie Canal and the two great railway systems of the state of New York was prepared for Government some years ago, and is worthy of careful study.* Summarizing this table into periods of ten years, the decadence of the canal becomes painfully prominent, and the supremacy of the railways asserts itself.

From the table that follows we find that whilst the railways have increased their business tenfold, the business of the canal has not been increased by one-half; and, if the detailed figures were examined, it would be seen that the canal has been gradually losing ground:—

*Harbor dues and transit charges at Montreal and Atlantic Ports, by Wm. J. Patterson, Secretary Board of Trade and Corn Exchange Association, 1880.

AMOUNT OF FREIGHT (TONS) CARRIED BY

Year.	New York Central and Hudson R. R. R.	New York, Lake Erie and Western R. R.	Erie Canals.
1858	765,407	816,965	3,665,192
1868	1,846,599	3,908,243	6,442,225
1878	7,695,413	6,150,568	5,171,320

Reduced to "Tonnage mileage," or tons carried one mile.

1860	199,231,392	214,084,395	809,524,596
1868	455,046,715	595,699,225	1,033,751,268
1878	2,042,755,132	1,224,764,438	937,789,464

Again, we may take the total amount of freight earned, and the average rate per ton per mile, for the same years :—

Year.	New York Central Railway Earnings.	Rate.	Erie Railway Earnings.	Rate.	Erie Canal Earnings.	Rate.
	\$		\$		\$	
1858	3,700,270	2.59	3,843,310	3.32	4,502,437	0.80
1868	9,491,427	2.59	11,425,739	1.92	9,012,659	0.90
1878	19,045,830	0.91	11,914,489	0.97	3,936,520	0.42

From this table it will be seen that in 1858 the canal was in a flourishing condition, with a rate one-third or one-fourth of that charged by the railways. Ten years later, with rates one-third of the railways, the latter were slightly in advance; and at the end of twenty years, when the rates were about one-half, one railway earned about five times, and the other over three times, as much as the canal.

In comparing the cost of carriage by rail with the cost of carriage by water, it has been proved by the experience of many years in the carriage of grain and other produce from, let us say, Chicago to the seaboard, that it can be carried by water (and that too in canals) and return a profit to the carriers for a total rate of from one to three-eighths of a cent per ton per mile. All railway experience goes to show that for a similar service by rail up to the present time, the actual cost of carriage, without allowing anything for interest on capital outlay, amounts to at least half a cent per ton per mile. Statistics of traffic between Buffalo and New York, extending over a number of years, go to

show that the freight rates per ton per mile by the New York Central, and New York, Lake Erie, and Western Railways have gradually been reduced from $2\frac{3}{4}$ cents per ton per mile in 1856, to 0.80 of a cent in 1881. During the same period the Erie canal carried at rates varying from one cent per ton per mile at the earlier date to 0.40 of a cent in 1881.

During the period embraced in these statistics, the proportion of tonnage carried respectively by rail and by canal altered from 64 per cent. as the proportion carried by water in 1856, to 22 per cent. carried by water in 1881, thus showing that in spite of the reduction in rates being proportionate both by water and rail, the rates by rail remaining more than double that by water, the water carriage has had to yield to land carriage. This result has been due, in large measure, to the enormous development of trade on this continent, which has practically revolutionized the formerly existing carrying systems both on land and water. In water carriage we find a steady growth in the size and speed of all vessels, and in the grain trade vessels are now afloat with double the capacity they had eight or ten years ago; and, whereas ten years ago sailing vessels were profitably employed, at the present moment the whole traffic is carried on by steam vessels, either barges or propellers. On land the same experience has been obtained. All rolling stock has been greatly increased, locomotive power has made enormous strides during the last ten years, and it seems to have been proved satisfactorily from carefully conducted investigations in the States, that it is cheaper to move a freight train at the rate of eighteen miles an hour than at that of ten or twelve miles.

II. THE CANADIAN ROUTE.

The distinctive portion of this route commences at the east end of Lake Erie, and comprises the navigation of the Welland Canal, Lake Ontario, to the town of Kingston, and the St. Lawrence canals to Montreal. The Welland Canal is $26\frac{3}{4}$ miles long, and has a total lockage of 326 $\frac{3}{4}$ feet. On the sills of the lock-gates of the old canal there is twelve feet depth of water; on those of the new canal, ten feet depth. Vessels of 500 tons and upwards have to be "lightered" or relieved of a certain

amount of their cargo, which is replaced on their arriving at the eastern end of the canal. The cost of this is two cents per bushel, and the average time occupied five hours and a half. The cargo is again transhipped into barges at Kingston, and taken down the river to Montreal. This distance is 170 miles, with six canals, $43\frac{1}{2}$ miles long in all, with a total lockage of $216\frac{1}{2}$ feet.

The history of the Canadian canals is progressive. Though they have had direct railway competition alongside of them, they have held their own. Their usefulness has been so certainly demonstrated as to call for their enlargement, and their rivalry with the Erie canal has been acknowledged by the canal authorities for many years.

It was said in the earlier part of this paper, that the North American continent offers the best and only basis for a full consideration of the comparative cost of land and water carriage. This is true as far as it goes, though it fails in its application to the whole year. The actual competition exists only for the summer months, from April to November; and it may be said that it is only in consequence of the freezing up of the waterways in Canada, that the railways are able to carry the grain of the country. The rapid approach of the winter after the harvest has been completed, prevents the grain from being transported to the ocean by water, at the season when it is necessary to convert it into gold: and the risk of a fall in prices until the next season's navigation, as well as the loss of interest in holding it, makes it necessary for the producer to send it forward by rail at a greater cost than that at which it could be carried by water, if that route were available when required.

The waterways of Canada and the United States, viz., the great lakes and navigable rivers, having required but a comparatively small outlay of capital to render them available for the transportation of an immense tonnage of the products of the country, afford an unrivalled opportunity for cheap transportation as long as the season of navigation lasts.

The railways on the other hand, as compared with those in a more equable climate, cost a much larger outlay to work, owing to the severity of the winter. The average cost of train mileage in the months of January and February amounts to $23\frac{2}{3}$ cts., as compared with the months of June and July, when it amounts to

19⁸⁴ cts. This does not include the cost of removing snow other than by locomotive power. The cost of maintenance of the permanent way, or track, is very nearly equal all the year round, and is proportionately heavy, owing to the fact that nearly all the repairs necessary have to be made during six months of the year; and that an equally large number of men has to be employed during the winter months, whose chief work consists in keeping the rails free from snow and ice, and attending to the damages created by frost. In a more favoured climate, these latter expenses are not incurred, and the ordinary repairs are spread over the whole of the year instead of having to be done in the six months of summer.

In carrying grain from such a centre as Chicago to the seaboard, whether by rail or by water, some of the expenses incurred in handling are common to both systems. Thus, the grain is stored in elevators at Chicago and these have to be employed, whether the grain from them is loaded into vessels or into railway cars. In unloading the cars or vessels at Montreal for transshipment to ocean steamers, a certain proportion in each case has to be bagged. In the case of unloading grain in bulk from the vessels or barges used in conveying the grain through the inland waters, floating elevators have to be employed for transferring the grain from the hold of one vessel to that of another; whilst in the case of grain carried by cars the same elevators have to be made use of, the grain being first put through the ordinary elevator into barges for that purpose,—unless (as at the present season) it is found to be more economical to ship the whole of the grain direct in bags from the cars to the ocean steamers.

When the question of capital expended for the conveyance of grain from, say, Chicago to Montreal is considered, it will be found that therein lies the chief reason why water carriage is able at all to compete against land carriage. A steamboat can be, and often is, constructed solely for this class of business, and it may be assumed that such a vessel costs a total of \$35,000, and has a capacity of 35,000 bushels. She will be able to make seven round trips in the season between Chicago and Kingston, carrying in that time 245,000 bushels; she will probably have to lighter through the Welland Canal to the extent of 5,000 bushels

each trip, at a cost of two cents and a half per bushel: and at Kingston she will transfer her cargo to barges which will be towed thence down the St. Lawrence and canals to Montreal. Her "round trips" to Kingston will cost \$2,000 each, or \$14,000 for the season, including lighterage, as above mentioned, and canal tolls; and her earnings will be from the east-bound trip alone, at the rate of seven cents per bushel, \$2,450 per trip, or \$17,150 for the season, leaving a net receipt of \$3,150, or nine per cent. on the capital for repairs, depreciation, and interest on outlay. This estimate leaves out of consideration any return freight she may carry on her west-bound trip, which in all probability will give her sufficient to pay depreciation at least. From these figures it will be seen what might be done if the navigation of the inland waters was open for the whole of the year; and what a disadvantage it is to have them closed for nearly six months out of every year, leaving unproductive during that period the capital expended on the construction and outfit of the vessel. It has been said that a vessel is capable of making seven round trips in the season. It must here be remarked that she does not make so many, as there is a period during summer, just before the new crop comes in, when vessels are not very busy in the grain trade. Still, enough has been said to show, that so far as competition exists for through traffic, the water-rates are lower than those by land; but in spite of free (American) canals, and free lake navigation, the course of trade appears to drift into the more expensive and rapid means of transport by land.

For local traffic or for short distances, water service is much cheaper, and a large number of small sailing vessels are regularly employed in this business all over the lake area.

In the case of carriage by railway from Chicago to Montreal, a comparison may be made from Chicago to Kingston, a distance of 670 miles. The cost of the railway, with necessary rolling stock, may be put down at \$40,000 or £8,000 sterling per mile, which is about the average of Canadian-built railways, amounting to a total sum of \$26,800,000 (£5,360,000) for 670 miles. In order to pay five per cent. on the outlay, annual net receipts of \$1,340,000 (£268,500), or gross receipts of, say, \$4,020,000 (£804,000) will be needed. Taking the proportion of freight to passenger traffic as two to one, which is about the average on the

Grand Trunk Railway, \$2,680,000 of this amount will be earned from freight, or \$6,000 per mile per annum. Supposing the railway to be unable to obtain a higher rate on grain from Chicago to Montreal than the steamboat, which averaged over a number of years, has been ten cents per bushel of 60 lbs.—made up of seven cents from Chicago to Kingston, and three cents for lightering in barges thence to Montreal,—the proportion to Kingston, due to the mileage of the ten cents through to Montreal, would represent a rate of eight cents per bushel or \$2.66 per ton, being at the rate of only 44 cents per ton per mile,—a sum which it is manifest would be insufficient to carry it and pay the working expenses of doing so.

The railway statistics of Canada show that the average receipts from freight of all kinds on the railways amount to \$1.50 per ton, and that, for every ton carried, a freight train runs $1\frac{1}{2}$ miles. This gives the average receipts as exactly \$1.00 per train mile. The receipts from passenger traffic are one-third of the gross amount, and the passenger train mileage is one-third of the total train mileage. It may, therefore, be assumed that the cost of carrying the passenger traffic is one-third of the total cost of operating the railway, and, on this assumption, we find, from the same statistics, that the cost of carrying freight per ton per mile amounts to seventy-seven cents. The net earnings of the Canadian railways amount to from $2\frac{3}{4}$ to 3 per cent. upon the capital cost. From these figures it will be seen that even to pay three per cent. on the capital outlay a profit of twenty-three cents per train mile is necessary; and if we accept 100 tons as the average paying load of all freight trains (which is somewhere close to the mark) it will be seen that a charge of one cent per ton per mile will require .77 of a cent per ton per mile to pay expenses and leave only three per cent. at the outside as the interest on the outlay of capital.

The time ordinarily occupied by a grain-laden vessel between Chicago and Montreal is from ten to twelve days; the cargo has to suffer breakage twice,—first in going through the Welland Canal, where the average lighterage is equal to nearly 25 to 30 per cent., and again at Kingston, where the cargo has to be transferred to barges in order to pass the St. Lawrence canals, for

delivery at Montreal. From Montreal to Liverpool the average time is ten days. A cargo can, therefore, be delivered in Liverpool in three weeks from the time it left Chicago, if it goes by the Montreal route. By the Erie Canal route, the same cargo would only have reached tide water at New York in that time!

In the case of a train-load of grain from Chicago to Montreal, the time would be probably three days in summer and four in winter; and to New York the time would be about the same. It is time, therefore, which, when long distances have to be covered, will enable the railways to hold their own against water competition, and it is manifest that, for short distances, railway carriage cannot compete successfully with water, where the highway is a natural one, in which a vessel can make a fair rate of speed in covering the distance. In a very valuable paper which is published in the last volume of the Proceedings of the Institution of Civil Engineers, the speed on canals and open waterways is discussed at full length.* The results attained by the writer tend to show that canals can compete with railways for heavy freight and minerals when carried at low rates of speed, and where speed is not of any importance. Even in England, canal routes can be used profitably to compete with railways. The attention of persons interested in these questions is directed to that very valuable paper. Where time is of importance, as it is both in the British and Canadian grain trade, in the autumn or fall, when the new season's barley is required for brewing purposes, it is the custom of trade to push on the transport and delivery of barley by the quickest, even if the most costly, route. And what holds good of barley, holds good of other merchandise to a great extent.

The conclusions at which we arrive are as follows:—

1. Where land and water routes exist side by side, and time is of importance, the water route cannot compete successfully with the land route.
2. Freight is seeking the land route in preference to the water, although it is dearer, as the saving in time compensates for the extra rate of carriage.
3. It is cheaper to transport freight in large quantities both

* "Speed on Canals," by F. R. Conder, Proc. Inst. C.E., Vol. lxxvi.

by land and by water, and it is cheaper to do so at a moderately increased rate of speed, as compared with that obtained a few years ago. This experience holds good for Britain, as well as for Canada and the United States.

II.

THE LIGHTHOUSE SYSTEM OF CANADA.

BY WILLIAM SMITH.

I. POLICY OF CANADA.

Under the system at present in operation in Canada, no light dues are exacted from any vessels, British or foreign, visiting Canadian ports. The cost of maintaining our lighthouses, instead of being a tax on the ships deriving advantage from the lights, as is the case in the United Kingdom and some other countries, is a direct charge on the general revenue of the country, and is required to be provided for annually by vote of Parliament. During the last fiscal year ending June 30th, 1884, the total cost of maintaining our lighthouses, lightships, steam fog-signals, automatic buoys, bell-buoys, ordinary buoys and beacons, including salaries, lighting apparatus, repairs, petroleum oil and all other materials necessary to keep them in an efficient state, was \$456,120, and the cost of the four steamers attending on the lighthouses was \$85,177, making altogether \$541,297. The cost of construction of new lights is not included in the figures above mentioned.

It may naturally be asked, why a policy of free lights, which exempts from dues the ships trading to our ports, many of them owned by Englishmen and foreigners, is preferred to the English system, which requires all vessels—British as well as foreign—to contribute their fair share to the cost of maintaining those

lights on the coast, which are so necessary to warn them of danger, and to guide them to their ports of destination? The answer is easily given. Canada is deeply interested in securing as large a share as possible of the carrying trade of grain, and other products of the west, from this continent to Europe; and, in competing with the port of New York and other ports in the United States for that trade, it is of the utmost importance that all dues and charges, on ships coming to the St. Lawrence, should be reduced to the lowest possible limit, as the freight to be transported naturally finds its way by the cheapest route. If the tax-payer of Canada, therefore, defrays the cost of maintaining the lights on our coasts, instead of requiring the ship-owners to maintain them, it is with the view of reducing shipping charges by the St. Lawrence route to a minimum rate, and of thereby securing a fair share of the carrying trade of the west.

After this explanation it will not be difficult to understand why the public men of Canada, many years ago, adopted the policy of free lights on their coasts; but it was not adopted previous to Confederation in the Provinces of New Brunswick, Nova Scotia, or Prince Edward Island, and it has not yet been adopted in Newfoundland, the lights in that colony being maintained by the shipping in the same way as they were formerly maintained in the Maritime Provinces,—none of them being competitors for any particular carrying trade, or having any special reason to adopt the free-light system.

In the United States, no light dues have been collected for many years, but during the war between the North and the South it became apparent that a large portion of their carrying trade was being done by foreign shipping, and a tax or tonnage duty of thirty cents per ton, payable once a year, was imposed on all vessels entering their ports. This tax was not imposed as light dues, but was generally known as the "war tax" on shipping, and has continued to be collected on all United States and foreign vessels up to the present year. The amount collected in this way by the United States Government has been large, and has assisted very materially in maintaining their very efficient system of lighting their coasts and inland waters. During the year ended June 30th, 1883, the amount collected on account of this tax was \$1,320,590. By the new law, considerable reduction is made on

the duty paid by all vessels; and by this Act there being no light dues in Canada, and only a small tonnage tax imposed on vessels entering the Maritime Provinces for the maintenance of marine hospitals and sick seamen, and on vessels entering the ports of Montreal and Quebec for the maintenance of a harbour police force, vessels entering ports in the United States from Canada, will be admitted on the payment of a duty, equal in amount to the tonnage dues imposed on vessels entering Canadian ports from the United States.

Many years ago it was found necessary, in the interests of ships trading between this continent and Europe, to establish a light at Cape Race, but, as this light was required principally for shipping which did not enter any of the ports of Newfoundland, the British Government did not consider it advisable to ask the Government of that colony themselves to erect and maintain such an expensive light. The British Government therefore established a light, and subsequently, at the request of Canada, it also placed a powerful steam fog-whistle in connection with the light, both of which have proved exceedingly useful to ships passing in that neighborhood. The annual cost of maintaining this light and fog-signal is £1,400 sterling per annum. In order to reimburse the British treasury for this outlay, a small tonnage duty of one-twelfth of a penny sterling per ton, afterwards increased to one-eighth of a penny per ton when the fog-whistle was established, was imposed on all vessels arriving in the United Kingdom from ports in North America, north of New York and including that port, and on vessels clearing from the United Kingdom for these ports; while with reference to vessels which entered and cleared in Canada, from or to ports in Europe not in the United Kingdom, and from which the British authorities could not collect dues, Canada was required by the British Government to collect the prescribed tonnage dues and remit them to the Imperial Treasury. By doing so, however, the Canadian Government considered that it would infringe the principle of free lights which had been adopted in Canada, and decided to pay the dues out of the Canadian Treasury. Under this arrangement, therefore, a foreign vessel coming to Canada for a cargo from a foreign port in Europe, and returning to a similar port with the cargo, uses all the Canadian lights, seen during her

voyage, free of charge: nor does the anomaly stop here; for the Canadian Government pays to the Imperial Treasury the dues chargeable for the maintenance of the light and fog-signal at Cape Race on account of such a vessel.

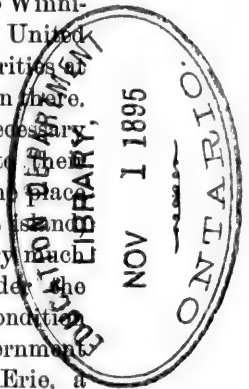
Another peculiarity of our lighthouse system may be here noticed. Our geographical position is such, that it has compelled Canada, in the interests of her trade and navigation, to build and maintain expensive lighthouses and fog-whistles on the territories of her neighbours, free of charge, to the ships of all nations. The island of Newfoundland, with its dangerous coast of rocks and shoals, lies immediately at the entrance of the Gulf of St. Lawrence, and many a good ship has come to an untimely end on its iron-bound coast, owing to fogs, snow storms, unknown currents, variation of compass, or some miscalculation or error of judgment. But as Newfoundland was not particularly interested in Canada's efforts to secure the carrying trade of the west, the only course to adopt was to ask permission from Newfoundland to establish lighthouse stations on her shores, which would be free to the shipping of Newfoundland, as well as to the vessels of all other countries having occasion to use them. This permission was readily granted, and Canada has erected, since Confederation, a lighthouse, with a steam fog-horn attached at Cape Ray, for the benefit of vessels entering the Gulf between Cape Breton and Newfoundland; one at Cape Bauld, with a steam fog-horn, for the benefit of vessels entering the Straits of Belleisle; a lighthouse at Point Rich, and one at Cape Norman, also for the benefit of vessels entering by that route. It was considered very important by steamboat-owners to have this route properly lighted, as it shortens the distance from Quebec to Liverpool by upwards of two hundred miles, as compared with the southern route between Cape Breton and Newfoundland.

Another instance occurred many years ago in New Brunswick, where the Government of that Province, previous to Confederation, wished to establish a light-station on a small island or rock, belonging to the United States, called Machias Island, situated near the coast of the State of Maine, and in the track of vessels trading to St. John and other ports in the Bay of Fundy. Possession of the island was obtained, in 1832, from the United States Government for this purpose, and two powerful lights were

established there, and more recently a steam fog-whistle was added to the light-station. These aids to navigation, built on foreign soil, have been of the greatest possible service to United States shipping, as well as to Canadian traffic,—heavy fogs frequently prevailing during the summer months on that coast.

A case occurred a few years ago in which the Canadian Government was desirous of having a new light established on Passage Island in Lake Superior, to facilitate vessels trading to Port Arthur in connection with our rapidly increasing trade to Winnipeg and the Northwest. The island belonged to the United States, and application was made by Canada to the authorities at Washington for permission to establish a lighthouse station there. After some correspondence they agreed to take the necessary steps to place a sum in the estimates to be submitted to the Legislature, for the purpose of erecting a lighthouse at the place referred to. We have now a very superior light on that island with a steam fog-whistle alongside of it, which adds very much to the usefulness of the light. While the vote was under the consideration of the Legislature at Washington, a condition was attached to it, viz., that the Canadian Government should erect a lighthouse on Colchester Reef, Lake Erie, a dangerous place both to Canadian and United States shipping. The condition was accepted by the Canadian Government, and tenders were invited for the work. Owing to stormy weather, however, the contractor has not been successful in laying the foundation, and he has abandoned the contract, but it is now in the hands of another contractor, and it is probable that a light will be in operation there next year.

It is due to the lighthouse authorities at Washington to state that, in all matters affecting the improvement of our lighthouse system, I have invariably found them most courteous, and both ready and willing to give all the information in their power, as well as the benefit of the experience which they have gained in the management of the lighthouse service required to light up their extensive coasts, both in the Atlantic and Pacific; and it is scarcely necessary for me to say that they have succeeded well in the performance of their important duty, as I think it would be difficult to find better lighted coasts than those of the United States of America, in any part of the world.



II. SABLE ISLAND LIGHTHOUSE.

A brief reference to Sable Island, which is not only one of our principal lighthouse stations, but the principal life-saving station in the Dominion, may not be out of place here, as it has recently been brought before the public by discussions in the newspapers, both of Canada and New York, in connection with the wreck of the Netherlands steamer, *Amsterdam*, which went ashore on the eastern bar of the island on July 31st last, about thirteen miles eastward of the lighthouse.

The island is situated in the Atlantic Ocean, about eighty-five miles from Whitehead Island, Nova Scotia, and about 150 miles north-east of Halifax. Although little known to the outside world, it is familiar to mariners as a long, narrow, white, sandy elevation, formed of two nearly parallel ridges, somewhat in the form of a crescent, concave to the north, and meeting at a point at either end, with sand bars or spits running out from them to a distance of some fifteen miles at the east end and probably six miles at the west end, over which the sea breaks with great fury during stormy weather. In the middle of the island and between the ridges is a narrow salt-water lake, about fourteen miles long. In very heavy gales the sea sometimes washes over the land on the south side of the island into the lake, and seals, which abound on the shores of the island, have been carried over the land into the lake by the heavy seas breaking over the beach. The continued action of the sea during stormy weather is having considerable effect in washing away the land at the west end, and new land appears to be gradually and steadily making on the bars at its eastern end, vegetation being now seen where it was formerly covered by water. At the west end the sea now covers land where formerly vegetation existed. The lighthouse at the west end had recently to be moved some distance to the east, owing to the encroachments of the sea, which would soon have undermined it, if the necessary steps for its safety had not been taken; and it is quite probable that the eastern bar is gradually extending and increasing in size, thereby rendering it every year more dangerous to ships coming too close to it during foggy weather or snow storms. The length of the island is about twenty-two miles, and it varies in breadth from a quarter of a mile to a

mile. Owing to heavy fogs and snow storms, it has long been an object of terror to mariners, who try to give it a wide berth.

Life-saving stations are established at the east end and at the main station ; and at each of these places there is a life-boat, built with proper metallic cylinders, in good repair and thoroughly efficient. In addition to the life-boats, there are surf-boats kept in readiness for any emergency, and the chief of the staff has directions to practise the men once a week. Two new life-boats of the most improved pattern are now building for these stations. At the main station is also kept a complete rocket apparatus, such as is used by the Royal National Life Boat Institution of Great Britain, in the use of which the men are practised from time to time. A life-car is also kept at the east-end station.

There are five stations on the island, and the staff, consisting of seventeen men, is divided as follows, viz., the Superintendent and six men, at the main station, about seven miles from the west end ; at the west-end lighthouse, the light-keeper and his assistant ; at the east end, the lighthouse-keeper, his assistant and two boatmen ; at the middle station, two boatmen ; at the foot of the lake station, two boatmen. In addition to the seventeen men of the staff, there are generally two or three extra men. The staff, with their families, number about forty-six persons. No one is allowed to reside on the island except by authority of the Marine Department.

Hitherto, in the case of wrecks, the men of the staff have been found well behaved and attentive to their duty, and as no liquor is allowed on the island, few complaints have been brought against any of them. Still, in the event of liquor finding its way there from wrecked vessels, it is possible that some misconduct might take place, as irregularities sometimes occur in the best regulated families, and the staff on the island is simply a large Government family, with the Superintendent at the head of it.

With reference to the complaint made by some of the passengers and crew of the *Amsterdam* that it took too long a time to obtain provisions for them after being landed at the lighthouse station, it may be mentioned that the principal stock of provisions is kept at the main station, fifteen miles away, the road being over heavy, soft sand ; and some time must necessa-

rily elapse before meals can be prepared, under such circumstances, for a crowd of people numbering 250. But an ample store of provisions is kept by the Government on the island, besides forty or fifty head of cattle, and upwards of 200 wild horses or ponies. It is not probable, therefore, in the event of a large number of persons being wrecked on the island, that they would suffer any great inconvenience for the want of provisions; and, in the case of the emigrants referred to, their complaints had no substantial foundation.

During fogs and snow storms, when the whole extent of the shore of the island cannot be seen from the out-look stations, some of the men patrol the beach on horseback at stated intervals, for the purpose of ascertaining whether any wrecks have taken place. In 1870, a schooner was sent by the Marine Department to the island with supplies and provisions and, after delivering her cargo, left with the view of returning to Halifax, but was never seen or heard of afterwards. It is supposed that she either foundered or capsized, as a heavy gale sprang up after she left.

The British Government contribute annually £400 towards the maintenance of the humane establishment kept up on this island, but nothing towards the construction or maintenance of the two large lighthouses erected there in 1873. The total cost of maintaining the lighthouses and humane establishments referred to, during last fiscal year, was \$6,115. Though great loss of life has occurred, from time to time, on the shores or bars of the island, still many shipwrecked people have been assisted in their misfortunes, and have partaken of hospitality at the stations on that bleak bank of sand.

Previous to 1873, no lights had ever been exhibited on Sable Island, as it was a disputed point for many years, whether the establishment of such lights would not be more dangerous to ships than if there were none,—the opinion being held, on the one hand, that vessels ought to give the island so wide a berth that the lights would not be visible to them; and that, even if they came within sight of them, it might tend to draw them too near the sand bars in the hope of making the lights and defining their position, thereby incurring a risk and danger which might be avoided if there was no inducement to make the island.

On the other hand, it was argued that if a powerful light was placed at each end of the island, they would be visible at a distance of twenty miles or more, quite far enough to warn vessels of their danger, and to enable them to define their exact position in a dark and stormy night, when they might not otherwise be able to do so accurately.

However, after a visit to the island in 1870, I was convinced of the necessity of some such provision and two large, substantial, wooden lighthouse-towers were erected: one at the east end, from which was exhibited a powerful dioptric light of the second order, and another on the west end, showing a powerful, white, revolving catoptric light, with three faces, following one after another, and then a total cessation of light. Both lights are visible from all points of approach to a distance of about twenty miles. The dioptric apparatus was manufactured by Sautier of Paris, and the revolving catoptric apparatus by Chanteloup of Montreal. Both these lights have been of great value to navigation, and the towers, glistening in the sun during the day, can be seen a long distance off, when the island itself cannot be seen, and are as useful as day beacons, as the lights are at night. Steam fog-whistles were also established at each lighthouse station; but, owing to the roar of the surf, it was found that they could not be heard at a sufficient distance to warn vessels of their danger, owing to the bars running out so far from the island, and they were discontinued some years ago. An automatic whistling buoy will be placed immediately by the Marine Department, near the end of the eastern bar, to warn vessels off that dangerous place. The cost to the Government of Canada of these two stations, including the fog-whistles, was \$70,000.

What is still wanted to make the life-saving station more efficient, is connection by telegraph cable between the island and the mainland, and telephone connection between each end of the island. When this is done, information relating to wrecks will be immediately telegraphed, and a steamer despatched to their assistance.

III. THE SYSTEM OF MANAGEMENT.

I shall now refer to the system upon which our lights are managed. The business of the Department of Marine and Fisheries is divided into two branches, with a Deputy Minister for each, one embracing the lighthouses and all other marine matters, and the other all matters relating to the fisheries. The Minister, being a political officer and a member of the Cabinet, changes with the Government, but his Deputies, who manage the routine business of each branch respectively under his directions, are permanent officials. No practical inconvenience, therefore, ensues when a change of Government takes place, as the permanent officials are familiar with all the details. In the Department there is a Chief Engineer, who is charged with the preparation of all plans and specifications in connection with the building of new lighthouses and the arrangement of the necessary lighting apparatus; and, in each of the Provinces of the Dominion, there is an agent of the Department to attend to its local business, as the distances are too great to admit of its being promptly attended to by the head office, and it is of such a nature that it requires continuous local supervision. The Minister annually submits to Parliament an estimate of the amount of money which he will require for the ensuing year, for the maintenance of the lighthouses, the construction of such new light-stations as he may recommend to be established, and all the other services of his Department.

Since the Department was organized, in 1867, when Confederation took place, up to the end of last year, 351 new lighthouses have been established, and the amount expended for this purpose, including the cost of providing twenty-three fog-whistles and nine steam fog-horns, was \$1,095,620, which would give an average of \$2,860 for each. Many of these lights were for the inland waters and rivers, built of wood, of an inexpensive description, costing under \$1,000. During the current year twenty new lights have been added to the list, all of which will be in full operation before the end of the season. All the lighthouses erected by the Marine Department since Confederation have been built of wood, as it was found to be much cheaper and it required less time to build them than if constructed of stone.

brick, or iron. Previous to Confederation, the lighthouses in Nova Scotia, New Brunswick and Prince Edward Island were nearly all built of wood, as being more suitable to the climate, and to the means at the disposal of the Governments of these Provinces; and some of them, after having been in existence for upwards of half a century, still appear to be in good condition, having been kept in proper repair since they were built.

In Ontario and Quebec, the principal lighthouses erected previous to Confederation were heavy, strong, substantial stone or brick buildings, and will probably stand for centuries, but, as compared with wooden structures, they were expensive, some of them costing upwards of \$100,000 for construction and equipment. They were built very nearly after the style of those designed and erected by Stevenson of Edinburgh, for the Commissioners of Northern Lights. The minor lights for river and inland navigation were built of wood, at a small expense, and have been found very suitable for the purposes for which they were intended.

The lighthouse which was built in 1870 on the Great Bird Rock, in the centre of the Gulf of St. Lawrence, may be taken as an illustration of the new system, as compared with that in operation in Canada previous to Confederation. It was a place to which navigators of the Gulf and ocean steamship owners were continually referring, as a locality where there was the most pressing necessity for a light, being a dangerous high rock, lying right in the track of vessels using the southern route between Europe and Quebec. Reports had been previously made by the proper officer as to its estimated cost, and all the necessary information obtained; but still up to 1870 no light had been established there, as the construction of a stone tower on the rock would not only have been very expensive, but would have required, probably, some years to build, owing to the difficulty of landing material, with such a heavy sea breaking continually around it. In 1870, Parliament was asked for a moderate sum for the purpose of erecting a wooden tower and other buildings at this place, and it was readily voted, although fears were expressed by some of our legislators that it was too great a risk to put a wooden building there in case of fire.

Plans and specifications having been prepared and the con-

tract awarded, the tower was built and securely anchored to the rock. A keeper's dwelling and oil store were erected, each apart from the other and from the tower, so as to prevent, as far as possible, the risk of fire, and all the buildings were well covered with iron-clad paint. A fine dioptric apparatus of the second order, made by Sautier of Paris, was placed in the lighthouse; and on September 20th, 1870, just four months from the time when the money was voted, one of the finest lights on this continent was exhibited there, 140 feet above the level of the sea and visible at a distance of about twenty miles. The cost of the buildings was \$10,000 and the apparatus about \$10,000, making altogether \$20,000. If it had been built under the previous system of stone work, the cost would probably have exceeded \$100,000. It has now been in operation fourteen years, and with good care it may last thirty years longer. This light, along with those on the Island of Anticosti, Magdalen Islands, and our principal lights in the River and Gulf, with the exception of those on Saint Paul's Island and in the Straits of Belleisle, have been connected with Ottawa by telegraph for some years past, so that information about wrecks, weather, and the state of the ice in the spring, is at once communicated to the Department, and to the Boards of Trade at Montreal and Quebec.

For countries possessing wealth and large populations, it is probable that the system of building everything on a substantial and expensive scale, and with a view to posterity, is the best; but for a young country like Canada, with extensive coasts to light up and a comparatively small population, the cheaper system of wooden towers and effective lights is evidently superior, as by this means we can probably build ten lights for one under the other system.

Our experience of lighthouses built on screw piles is but limited, as we have only one, and that was built on the shifting sands at the mouth of the Fraser River, in the Straits of Georgia, British Columbia, at a cost of \$21,000. The lighting apparatus is dioptric of the third order, made by Chance of Birmingham. Some difficulty was experienced by the contractor in sinking the piles, but that was eventually remedied, and the light is now in full operation, and is described as one of

the most brilliant on the Pacific coast. The extent of sea coast in the Dominion to be lighted up and provided with fog-whistles, bell-buoys, automatic buoys and ordinary buoys and beacons, is 3,200 miles; inland coast, 2,600 miles, making altogether about 5,800 miles of coast to be lighted and buoyed. To effect this object, we have 308 sea-coast light-stations, 224 inland light-stations, and 17 lightships. The number of light-stations with fixed lights is 467; with revolving lights, 82; making altogether on December 31st, 1883, a total of 549. The Province of Quebec has 146 light-stations; Ontario, 139; New Brunswick, 82; Nova Scotia, 119; Prince Edward Island, 39; British Columbia, 7. The lightships are divided as follows:—Quebec, 8; Ontario, 5; New Brunswick, 2; Nova Scotia, 1, and one at the mouth of the Red River, in Manitoba. Three of them are strong, English-built, iron vessels, having powerful steam fog-whistles on board, and are stationed in the lower St. Lawrence, below Quebec.

The system adopted in Canada for the construction of new lighthouse stations is by contract, public notice being first issued, inviting tenders for the work on plans and specifications prepared by the Engineer of the Department; and, when the tenders have been received, the contract is invariably awarded to the person making the lowest tender, if he is prepared to go on with the work. The contracts have generally been taken at low prices.

New light-stations are generally established on the representations of seafaring men. Members of Parliament representing maritime districts, and possessing local knowledge, have also much influence in the establishment of such stations. When representations have been made to the Minister of Marine, urging the necessity of a new light in some particular locality, an investigation is made by the Department, and the opinion of its practical officers obtained as to the necessity for the proposed light, with reference to the dangers of navigation and the amount of traffic to be served. The Minister then decides on the merits of the case, and, if satisfied that it is necessary and for the public interests, he places it in the list of new lights proposed to be built during the ensuing year, which he submits to Parliament with the recommendation that the necessary funds

be provided; as soon as the vote has passed, arrangements are made for securing a site and proceeding with the work.

IV. FOG-WHISTLES AND BUOYS.

The steam fog-whistles in use in Canada may be considered a part of our lighthouse system, and have been found to give good results. They are valued on some parts of our coast, where fog prevails in the summer and snow storms in the winter, quite as much as the lighthouses. The machine in use is simply a multitubular boiler, with a small engine attached, for opening the valve and regulating the blasts of steam at stated intervals, as desired. The blast can be distinctly heard, under ordinary circumstances, to a distance of from four to ten miles, according to the state of the atmosphere; but on some particular occasions it has been heard as far as thirty miles. The whistle at the top of the escape pipe for the steam is usually 10 inches in diameter, and 1 foot, 6 inches high. The cost of the steam fog-whistles, without the buildings, tanks, or water-arrangements, is about \$2,000, but the consumption of coal is necessarily great, and a plentiful supply of water is required. Owing to the expense of keeping this description of fog-alarm in operation, the Department has not erected any new ones of late years.

The description of fog-horn, recently adopted, is the Champion automatic fog-horn. It requires very little fuel and water, and has given satisfaction. The sound is produced by compressed air passing through the horn, instead of steam. The machine consists of a tubular boiler, 5 feet, 6 inches high, 2 feet, 9 inches in diameter; a large air cylinder, 3 feet, 8 inches in diameter, 3 feet, 10 inches long, to which is attached a horn, carrying a powerful reed, and a steam cylinder 2 feet in diameter, with an automatic apparatus for the control of the supply of steam. Its action is as follows:—When the steam is turned on, it enters the steam cylinder and causes a piston to ascend; attached to this piston, by means of their common piston-rod, is another piston working in the air cylinder, which is supported above the steam cylinder by means of four columns attached to the bed plate. By this means the air contained in the upper cylinder is forced through the reed, the tongue of which is of

steel, 8 inches long, 2 inches wide, and $\frac{1}{8}$ of an inch thick, causing it to vibrate rapidly, and thus to emit a loud sound. When the pistons approach the top of their stroke, the lower one, by a very simple contrivance, closes the supply valve and opens the exhaust valve, which allows the expended steam to escape; consequently the pistons, by their own weight, gradually descend, thus allowing the air cylinder to fill with air again. When the pistons reach the bottom of their stroke, the upper one reverses the movement of the valves, when the above operations are automatically repeated. By means of an adjustable valve on the exhaust pipe, the intervals between the blasts can be closely adjusted. The amount charged for these machines by the patentee is \$2,000, but they can be made by competition for \$1,000 each, when several are taken. They are well suited for localities where it is difficult and expensive to provide fuel and water, but it is doubtful if their sound can be heard at as great a distance as that of the steam whistle. We have nine automatic fog-alarms in use, and the Department is about to establish twelve more in different parts of the Dominion where fog frequently prevails.

The Courtney automatic whistling-buoy, of which we have eight in Canadian waters, is a recent American invention, and has been found of great service to shipping, in connection with our lighthouse system. It is of no use in completely smooth water, without any swell, but requires a rough, rolling sea to make it work effectively, and under such circumstances it emits a loud blast, similar to a compressed air fog-horn worked by steam. The large-sized buoy is 10 feet in diameter, and has a hollow iron cylinder about 30 feet long, open at the lower end underneath it, which is filled with water, and as the buoy goes up and down on the waves, the water in the cylinder being stationary compresses the air at the top of the cylinder and drives it through the whistle above the buoy, thereby causing the blast. This description of buoy cannot be used in shallow water, but is intended to be moored some distance away from the shoal or danger to be avoided. The cost of this buoy is \$1,575 in New York, without the ground tackle. We are now having two made, one to be anchored off the end of the eastern bar at Sable Island, and the other off Point Lepreau, in the Bay of Fundy.

A new description of buoy, with a gas light arranged in a frame on the top of it, enclosed in a small dioptric apparatus or Fresnel lens, has recently been used by Trinity House of London, and by the Commissioners for managing and lighting the Clyde, in Scotland, with good results. The gas is made specially for the buoys from petroleum oil, and is compressed into an iron cylinder, when about to be transferred to the buoys, and when a buoy of the largest size is properly charged with this compressed gas, it should burn day and night for ninety days, without requiring any attendance. Two of these buoys, with the necessary gas works to be erected at Quebec, have been ordered through Trinity House, London, and will be placed immediately in the Lower St. Lawrence. If found to work successfully, they may possibly take the place of small lighthouses or light-ships. They can be seen at a distance of seven miles. The cost of the buoys, with a bell attachment, to warn vessels of their locality, will be \$3,750 each, and the cost of the gas works, with store-holder, will be \$3,500. The arrangement of the lantern is such, that while the necessary air is admitted to feed the flame, no water can enter, no matter how high or violent the sea. The bell-buoys used are now made in Canada, by contract, similar to the bell-buoys of Trinity House, London, and are constructed of boiler plate-iron, with compartments and water ballast, the cost of which is about \$1,000.

V. LIGHTING APPARATUS IN LIGHTHOUSES.

The lighting apparatus in use in the lighthouses of Canada is very much the same as in other countries, viz., catoptric and dioptric. For our large important stations, having revolving lights, the catoptric apparatus is used. It consists of powerful lamps connected with flat oil-receivers at the back of the reflectors. At the back of the lamps are parabolic silvered reflectors, varying in size from eighteen to twenty-four inches in diameter, for the purpose of reflecting the rays, and throwing them out in a certain direction. A number of these lamps, with reflectors fitted to them, say three, four or five, are fixed to the sides of an iron frame, having two, three or four sides, and the whole is made to revolve by clock-work machinery and heavy weights.

If the light is required to show, say, every three minutes, two faces will be found sufficient; if oftener, three or four faces may be used, as the case may be. The reflectors on each face or side of the revolving frame are thus successively directed to every point of the horizon, and the combined result of their rays forms a flash of greater or less duration, according to the rapidity of their revolution,—the light gradually increasing till it attains its full power, and then gradually diminishing, till it becomes invisible. As regards the distance at which one of our powerful revolving catoptric lights can be seen, it is only limited by the horizon; and with an ordinary high tower, the light being about 100 feet above the level of the sea, it should be visible on a clear, dark night, nearly twenty miles distant.

If lights are placed at too high an elevation, there is some risk of their being obscured by clouds or mist, while the land lower down may be quite visible. This was the case at Belleisle, near the entrance of the Strait, where there is a dioptric light of the first order placed at an elevation of 470 feet above the level of the sea at high-water mark, but it is frequently obscured by clouds, while the land and breakers below can be easily seen. To remedy this difficulty, another light has been erected on the rocks nearer the edge of the water, and this minor catoptric light can be seen sometimes when the large dioptric light above is invisible.

At some of our large catoptric lights we have as many as eighteen or twenty lamps, which not only consume a considerable quantity of oil but create much heat, causing danger of explosion if the oil is not specially prepared for the service. One great objection to catoptric lights, as compared with dioptric, is the large consumption of oil required for so many lamps, whereas in the dioptric apparatus only one lamp is necessary. We have 483 lights in the Dominion, the apparatus of which is on the catoptric principle; and, as all the lamps and reflectors for these lights are manufactured in this country at a much less cost than dioptric apparatus can be imported from England, it has been found advisable to use this kind for all our revolving lights, and for fixed lights of a minor character.

The dioptric apparatus is used at some of our great sea lights, such as Sable Island, Belleisle, Point Amour, Cape Rosier, Bird

Rock, Sambro Island and Seal Island, where the lights are fixed-white, and they were manufactured either by Sautier of Paris, or Chance of Birmingham. A dioptric is made of cut crystals or prisms, highly polished; and the large sizes, such as those of the first or the second order, are very expensive. Only one lamp is used, with concentric wicks, numbering from one to four or five, according to the size of the apparatus, and from this are emitted luminous beams in every direction. The lamp is placed in the centre of the crystal apparatus, with an oil-receiver so arranged as to keep a constant supply of oil up to the flame without obscuring any portion of the light. In the case of the dioptric or lens system, the controlling apparatus which gives brilliancy to the light is placed before it instead of behind it, as in the case of the catoptric apparatus. This arrangement of crystals surrounding the lamp is so formed as to refract the beams of light from the lamp into parallel rays in the required directions. The lamp requires careful, constant, attentive watching by trained keepers, in order to regulate the size of the flame of each of the wicks, and it should never be left without an attendant when it is in operation. The mammoth flat-wick lamp in use in nearly all our catoptric apparatus, has given the best results, nor does it require continuous watching. It is therefore much better suited for our Canadian lights, which are maintained at a small expense, and are, as a rule, supplied with only one keeper. There are sixty-six dioptric lights in the Dominion, two of which are of the first order, twelve of the second order and six of the third order. The cost of a first-class revolving catoptric apparatus, made in this country, with a twelve-feet iron lantern, is about \$2,913. The cost of a first-class fixed-white dioptric apparatus, with lantern and lamps complete, made in England, is about \$14,800; but for complicated flashing lights, they reach as high as \$22,350.

The illuminant used in the Canadian lighthouse service is petroleum of Canadian production and manufacture, and is required to be of the best quality, double distilled, standard white, extra refined, free from acids or other impurities, to weigh, at 62° Fahr., not less than 7.85 lbs., nor more than 8.02 lbs. per gallon; to withstand a flash test of 115° Fahr. by the new standard pyrometer. In burning for twelve hours, the oil must produce a brilliant and nearly uniform flame, without crusting the wick or

discoloring the chimney, and with a loss of not more than 15 per cent. in power during that period. About 100,000 gallons per annum are required for the service, and tenders were invited last winter for a supply for three years. The contract was awarded to the Imperial Oil Company of London, Ontario, at twenty cents per imperial gallon, delivered at Hamilton or Goderich, and the oil delivered this season has been up to the standard quality. With oil at such a low price, the quantity consumed becomes of very little consequence, and therefore the catoptric system, which consumes very much more than the dioptric, is the best suited for our requirements, as the cost of catoptric apparatus is very much less in the first instance than that of dioptric.

VI. LIGHTHOUSE SERVICE.

The number of persons employed by the Government to attend to lighthouses is 656, and the salaries paid to them range all the way from \$80 for small river lights, up to \$1,500 per annum. The last mentioned sum is paid to the keeper of Bird Rock light, who has also to fire a signal-gun during foggy weather. He is required to keep two assistants, whom he feeds and whose wages he pays out of the salary allowed him. The situation is by no means an enviable one, as the keepers must remain on the rock all the winter, and as it is high out of the water, with a small flat surface, they must exercise great caution while moving about, as it is usually covered with ice during the winter months. When the wind is high, they sometimes find it necessary to go from one building to another on their hands and knees, to avoid being blown off into the sea. The salary usually allowed to the keeper of a sea-coast light is between \$300 and \$500, and there are often many applicants for any vacancy. The salaries of keepers of river and harbour lights are small, as they generally have opportunities of adding to their income by farming, fishing, or some other occupation in their immediate neighborhood. At stations where an assistant is necessary, the salary of the keeper is increased to enable him to hire one, but the Government does not appoint him or recognize him in any way. The duly appointed keeper is held responsible for the proper performance of the duty.

Before recommending a person to His Excellency in Council

for the position of light-keeper, the Minister of Marine usually consults the member of Parliament for the county or district in which the vacancy has occurred (if he is a supporter of the Government), and obtains his recommendation of a suitable person for the appointment. There is no system of promotion among the keepers, and it is understood that the appointments are usually made through political influence. The salaries of some of the keepers are occasionally increased, owing to length of service, good conduct, additional work being imposed on them, or their salaries being too small, but they are rarely moved from one place to another, in the way of promotion. Taking the light-keepers as a body, they are a very intelligent, useful and respectable class of persons, and, as a rule, perform their duties very satisfactorily, although the remuneration is exceedingly moderate. The plan of selecting them also works well, as the member who has the responsibility of nominating a keeper, is generally careful to recommend a good, reliable man, who may be trusted with the management of the light.

VII. CANADIAN SYSTEM COMPARED WITH OTHERS.

The expansion of the lighthouse system of Canada during the last seventeen years has been great. In 1867, when the four Provinces were confederated, there were 198 light-stations in the Dominion and two fog-whistles, and at the close of this season there will be 569 light-stations, thirty-six fog-alarms and ten automatic whistling-buoys in operation. As compared with the lighthouse systems of the United Kingdom and the United States, our lights, although very good and suitable for our trade, are not of such a high class, and have cost much less to build and maintain than those of the countries referred to; but in neither of these countries have ship-owners been so much favored as in Canada.

In the United Kingdom the light dues collected in the year 1883-84 for all general lights managed by Trinity House, London, the Commissioners of Northern Lights, and the Commissioners of Irish Lights, was £476,116 sterling, equal to about \$2,380,580, while the tonnage dues collected from shipping in the United States, although not nominally for light dues, was, as already

shown, \$1,320,590. In England, Trinity House, or, to adopt their own style, the Corporation of the Elder Brethren of the Holy and Undivided Trinity, has the management of the general lights for which light dues are collected, and that honorable and ancient corporation may be considered as the chief lighthouse authority of the world, while amongst their officers are gentlemen of high scientific attainments and great experience. The Marine Department of Canada has been under many obligations to the officers of this corporation for advice and assistance, which have always been most readily and freely given. Trinity House has under its management 65 light-stations with dioptric lights, 21 with catoptric lights, and 46 light vessels with catoptric lights, making altogether 132 light-stations. In Scotland, the general lighthouse authority is the Commissioners of Northern Lights, who have under their charge 45 light-stations with dioptric lights, 13 with catoptric lights, and 10 catadioptric, making 68 light-stations in all. In Ireland, the general lighthouse authority is the Commissioners of Irish Lights, who have under their jurisdiction 35 stations with dioptric lights, 41 with catoptric lights, and 12 light-vessels with catoptric lights, making 88 in all.

The three lighthouse authorities who have the management of the general lighthouses for which light dues are collected in the United Kingdom, have therefore under their jurisdiction 288 light-stations. In addition to these lights, however, there are a number of local harbor lights of a minor description, which are maintained by local authorities, such as Harbor or Dock Commissioners, and these will probably number about 140, making altogether about 428 lights, large and small, on the coasts of the United Kingdom, with a coast line of about 3,500 nautical miles. The cost of maintaining the 288 light-stations under the jurisdiction of the three corporations referred to, including the maintenance of steamers and supply-vessels during the year ended March 31st, 1883, but not including the cost of collecting light dues, superannuation of officers, or works in connection with building new lighthouses, was £303,830, equal to an average of about £1,054 for each, or about \$5,270.

In the United States, the general lights are managed by a Lighthouse Board with two official secretaries, one an officer of the army and the other an officer of the navy. This Board has

under its management 746 light-stations, with dioptric lights, and 32 stations with catoptric lights. There are besides these 1,049 minor lights, established on western rivers, that cannot strictly be placed in either of the above classes. There are also 30 light-vessels, making altogether 1,857 lights in the United States, large and small, with a sea-coast line to be lighted, roughly estimated at 12,600 miles; inland coast, roughly estimated at 3,000 miles, and length of rivers to be lighted, roughly estimated at 4,000 miles, making altogether about 19,600 miles of sea and inland coast and rivers to be lighted. The total cost of maintenance of all these light-stations, light-vessels, buoys and beacons, steamers attending on lights, etc., for the year 1883, was about \$2,000,000. If the small lights on the western rivers are included, these figures would give an average cost of their lights at \$1,077 for their maintenance.

In Norway, there are 132 lights maintained by the Government which cost \$157,000, equal to an average cost of about \$1,189 for each. The lights in Norway are maintained by light dues on shipping.

The average cost of maintaining our Canadian lights, large and small, including the cost of maintaining four steamers to attend on them, and the buoys and beacons of the Dominion, is about \$1,000 each per annum.

In 1872, long before our lighthouse system had risen to its present state of efficiency, a committee of Trinity House, London, visited this country and the United States, with the object of examining the fog-signals in use on this continent, and acquainting themselves with the working of the lighthouse system in the two countries. On their return to London, they reported most favourably of our lighthouse system, both as to its economy and efficiency. They referred to the lights which they saw in the Gulf and River of St. Lawrence, as showing a bright light a long distance off, and spoke of those they visited as being scrupulously clean and in good order. With reference to the lights on Lake Ontario, they stated that they were observed, clear and strong, at a distance of fifteen miles, and that the strength and efficiency of all the Canadian lights which they saw, struck the committee forcibly as indicating the high value of the illuminant used, and they char-

acterized the Canadian system as one of simplicity and economy, admirably adapted to a young country; adding that a higher ratio of illuminating power was obtained from our mineral oil in catoptric lights than in any other arrangement. With reference to our fog-signal system, they stated that, while simplicity and economy were also the ruling influences, it was good and effective, and had been of great benefit to the trade.

Such was the testimony, in 1872, of these able and disinterested gentlemen of experience, as to the system of lighthouses and fog-signals then in operation in the Dominion of Canada, and since that time great improvements have been made on our coasts, both as regards the number and efficiency of our lights and fog-signals. A vessel may navigate from Lake Superior to Halifax, and can scarcely be out of sight of some one or other of the numerous lights which will guide her on her voyage through the inland seas, rivers and Gulf of St. Lawrence to her port of destination. Between Montreal and Quebec a large passenger traffic is carried on by night-boats during the season of navigation, and an accident to these boats, which are the admiration of travellers, is almost unknown. The system of leading lights, for this portion of our great river, has been much admired by nautical men, who have travelled in these boats and watched their navigation during the night. The shoals are numerous, and the channel in some places intricate, but by the excellent system of range lights and the careful steering of skilled pilots, these boats, loaded with passengers, are enabled to pass up and down every night with regularity and comfort.



III.

THE FISHERIES OF CANADA.

BY L. Z. JONCAS.

I. EXTENT OF CANADIAN FISHERIES.

I am not afraid of saying too much, when I assert that the Dominion of Canada owns the largest and the richest fisheries in the world. "As a national possession," says the Hon. Peter Mitchell, who was our Minister of Marine and Fisheries in 1870, "they are inestimable; and, as a field for industry and enterprise, they are inexhaustible. Besides their general importance to the country as a source of maritime wealth and commerce, they also possess a special value to the inhabitants. The great variety and superior quality of the fish products of the sea and inland waters of these colonies afford a nutritious and economic food, admirably adapted to the domestic wants of their mixed and laborious population. They are also in other respects specially valuable to such of our people as are engaged in maritime pursuits, either as a distinct industry or combined with agriculture. The principal localities in which fishing is carried on, do not usually present conditions favourable to husbandry. They are limited in extent and fertility, and are subject to certain climatic disadvantages. The prolific nature of the adjacent waters, and the convenience of their undisturbed use, are a necessary compensation for defects of soil and climate. On such grounds alone, the sea and inland fisheries to which British subjects have claims on this continent are of peculiar value."

To this statement of one of our most prominent public men, I will merely add a few words, to show more clearly what an immense field is opened by our fisheries, not only for the industry of our own population, but for the enterprise of immigrants,—a field capable of sustaining three or four times as large a population as that of Canada at the present moment. Canada is equal in extent to the republic of the United States; it is almost as large as the whole continent of Europe; that is to say, it contains about one-fourteenth of the land of the world. Bounded by three oceans, it has, besides its numerous inland seas, over 5,500 miles of sea coast, washed by waters abounding in the most valuable fishes of all kinds. Setting aside for the moment the 3,000 miles of sea coast in British Columbia, and the immense inland seas of the great Northwest Territory,—the richness of which has not been properly utilized, and is not yet well known,—we have, in the old Provinces of the Confederation, 2,500 miles of sea coast, and inland seas covering an area of 122 square miles; besides a considerable number of lakes of smaller extent and many important rivers teeming with varieties of fishes of great commercial value.

From whatever point of view we may regard them, the teeming waters of the British American possessions, and those which form their great lakes and magnificent rivers, must be reckoned as a national property, richer and more perpetual than any mere estimate in money can express. "It is in the highest degree satisfying," observes the Hon. Peter Mitchell, in his above mentioned Report, "to find that Canadians are becoming every year more and more alive to the vast importance of their fisheries, and that they are now more than ever anxious to preserve them as the finest material portion of our colonial heritage."

The fact of foreign nations having always clung with tenacity to every right and common liberty which they have been enabled to secure in these fisheries, and the eagerness which foreigners manifest to establish themselves in the actual use of such extensive and lucrative privileges, constitute the best extrinsic evidence of the wide-spreading influence of their possession, and the strongest testimony to their industrial and commercial worth.

II. VALUE OF CANADIAN FISHERIES.

I may perhaps be asked, whether the richness and the value of the Canadian fisheries are in proportion to their extent. Our fisheries, on account of the insufficiency of our population, are far from having acquired all the development of which they are capable; their annual yield, however, if we take into consideration the number of men actively and regularly employed in working them, and compare them with foreign fisheries of the same nature, proves that they are the richest and the most productive in the whole world. As our population grows, and as we are able to devote more attention to this industry, the increase in the value of our fisheries will be proportionately very great.

Professor Brown Goode, American Commissioner at the London Fisheries Exhibition in 1883, in one of his speeches at the Fishery Congress in connection with the Exhibition, referred to the immense growth of the Canadian fisheries, during the last ten years. He declared that in the course of his own studies, he had occasion each year to peruse the Canadian reports, and had been "perfectly amazed" at the rapidity with which this industry had been developed. In fact, if we consult the statistics so carefully collected every year by our fishery officers, these official figures will show that the value of the Canadian fisheries, which in 1870 was only \$7,573,000, had doubled during the succeeding ten years, and amounted in 1880 to \$14,500,000. And if we open the last official Report, published by the Department of Marine and Fisheries, we shall see that the same fisheries produced in 1883 the sum of \$17,500,000, representing an increase in value of three millions of dollars in three years.

Although our system of inspection is effective, although the organization of the outside service of our Department of Marine and Fisheries and our method of collecting fishery statistics are given as models to other countries, yet they are susceptible of many improvements. It is easy to understand that in such an extensive country as Canada, where every settler has facilities for fishing, it is utterly impossible for our statisticians to impart a mathematical precision to their Reports, or to give accurately the value of the home consumption.

The editor of one of the leading newspapers of Nova Scotia, the most important of our Maritime Provinces, says in his issue of June 25th, 1884: "The returns before us of the fish taken in our waters and of their value are well known to be very far below our real catch, and such published figures, regarded as facts, are misleading. We believe that the present officials do their best to give the most correct returns possible, but *it is absurd to think* that our annual Fishery Statements give the full catch of fish taken in our waters. It is most important, remembering our present position and the offers that may be made to us, after the abrogation of the Halifax Treaty, by our friends at Washington, for us to have the most exact and complete returns possible of the extent and value of our fisheries. Though the inspectors do their best, we do not believe that any of them pretend that they can get at more than the approximate catch of our fish; or that the returns they send in represent the full value of the fisheries from their respective Provinces.....The returns from the Province of Ontario, in 1883, give the total catch as valued at one million of dollars. Men who are well informed in regard to the fisheries in that Province state as their belief, that the value of the catch is nearly double the figures given, instancing the operations of one firm alone which handles more than a quarter of a million dollars' worth of fish."

The returns of the total catch in the Island of Cape Breton, we hear from good authority, are much below the actual figures. The same thing may be said of Nova Scotia, New Brunswick, Quebec and British Columbia where the value of the fisheries is certainly not accurately represented by the figures given.

The \$17,500,000, mentioned above as the value of the Canadian fisheries in 1883, cannot therefore be anything else than the value of the fish prepared for exportation or sold on the Canadian markets. In that amount cannot be included the \$5,000,000, the approximate value of the fish caught and consumed by the native population of Manitoba and British Columbia. And in the other provinces of the Dominion, with a population of over 4,000,000 inhabitants, for whom fish is one of the principal articles of diet, the estimated value of the fish consumed is \$12,000,000. If, therefore, we add together the value of the fish cured for the trade, and that of the fish captured for local

consumption, we have, for 1883, a grand total of \$34,500,000. These figures speak for themselves, and give an idea of the immense richness of the Canadian waters.

Great Britain and the United States, like Canada, have very extensive and very productive fisheries; and by way of further demonstration of the richness of our waters, we may draw a comparison between their products and those of the Canadian fisheries. We have in Canada 50,000 men regularly employed in the fisheries. Their labour, as shown by the last official returns, has produced \$17,500,000, or \$350 for each fisherman. Great Britain, for the working of her fisheries, employs 113,640 men, and their labour, according to the figures given by the Duke of Edinburgh, in his very interesting essay on the British fisheries, produces annually 615,000 tons of fish, representing a value of \$35,000,000, or \$308 for every fisherman; showing a difference in favour of the Canadian fisheries of \$42 for each fisherman.

The statistics for 1882 show that 132,000 men were employed in the fisheries of the United States. The labour of these men produced \$44,500,000, or \$337 for each man, yielding a difference, in favor of the Canadian fisheries over those of the United States, of \$13 for every fisherman. It may be here observed that no inconsiderable portion of the fish taken by the United States fishermen has been caught in the Canadian waters.

It must be added that, in this comparison, I put aside 3,000 miles of sea-coast on the Pacific ocean, the richness of which is still unknown to us and for which we have no statistics; because this vast field as well as the numerous inland seas flowing towards the Arctic ocean, could not, for want of hands, be worked till now. We have statistics for about one-half of the extent of our fisheries, and it is that half only which is here compared with the whole fisheries of Great Britain and of the United States. It must also be noted, that on account of the severity of our climate, our fisheries can only be worked during about seven months of the year, while the American and Englishman fish all the year round; so that the Canadian fisherman earns, in seven months, \$42 more than the English fisherman, and \$13 more than the fisherman of the United States, both of whom work from January to December.

What I have just said, is a sufficient justification of my assertion, that the Canadian fisheries are the richest in the world.

And yet, in this comparison, I have said nothing of the perfection of the fishing implements used by the fishermen of the neighbouring Republic and of Great Britain. Nor have I mentioned the large sums spent by them in the building of continually improved fishing crafts, or of the millions expended by their Governments in the buildings of piers, break-waters or other improvements for the protection of the fishing industry. In 1882, besides about 1,000 decked vessels, the total tonnage of which was not more than 40,000 tons, we had to work our sea-fisheries with nothing else than small open boats, well made, solidly built, good sailers, perhaps the best of their class; but with which our fisherman, although hardy and skilful, cannot venture very far out at sea, cannot follow the fish in its frequent migrations, and, in consequence, cannot give to our fisheries all the extension of which they are capable. On the other hand, the American fishing fleet numbers, besides many thousand smaller boats, 6,000 schooners of 209,000 tonnage; and the British fishing fleet is composed of 33,000 vessels, most of them of large size, and many of them steamboats. No necessary expense is considered too large by the fish merchants and ship-owners of those countries, and their fishermen, manning convenient and safe boats, can follow the fish everywhere.

The English and United States Governments and the capitalists of those countries, understanding what an important contribution their fisheries are to the national wealth, encourage by every possible means those who carry on that industry. Fishery Bureaux, headed by their most eminent, influential, and practical men, are formed to seek for the best means of rendering their fisheries more and more productive. Notwithstanding all these encouragements, the statistics prove that the fisheries of Canada are more productive than those of Great Britain or America.

I am happy to be able to state that, owing to the encouragement lately given by our public men, the building of Canadian fishing crafts has progressed rapidly. The swift schooners of our Maritime Provinces, can already, compete fairly with American fishing vessels, reputed the best of their class in the world. Steamers, which are now used in the fisheries on our lakes, will doubtless be seen soon among the vessels used for the working of our most important sea fisheries. Considerable sums

of money are spent every year, by our Government, on the building of harbours of refuge and of lighthouses for the guidance of the fishermen. Last year \$150,000 were paid to our fishermen, and if our public men are willing to continue to help the advancement of an industry, which for the future of the Dominion is so highly necessary and important, we may hope that, in the near future, we shall have no reason to envy our brothers beyond the sea, or our rich neighbours.

"The incalculable importance," says a writer in the *Montreal Gazette*, "of such invaluable fisheries in colonization, in the development of commerce, in adding to the country's food produce for home consumption, and for the training of skilled seamen for naval and merchant marine, are points which the histories of all great maritime nations amply demonstrate. The histories of France, Holland and Great Britain are striking illustrations of the vast national benefits derived from the prosecution of sea fisheries. What but the rough experience of British fishermen in prosecuting their labours on one of the roughest coasts of the world, has made the skill and bravery of British seamen, at once the admiration of all nations, and the dread of their foes. It is rough experience that makes a sailor, and it is just such experience that has enabled the seamen of the Maritime Provinces of Canada to take a first place for skill and coolness among their fellow subjects of the British Isles."

III. A QUESTION.

The question here arises: Would not the Canadian fisheries soon be exhausted if they were worked on a much larger scale; and would it be wise to sink a larger amount of capital in their improvement? It seems to be admitted by all those who have made a special study of this important question, that fresh-water fisheries, such as salmon, trout, white-fish, etc., and also the sea shell fisheries, such as oysters and lobsters can be, with time, exhausted by indiscriminate fishing. This is generally understood, and our inland fisheries, protected by wise regulations, will continue for years to come to enrich those who work them.

As to those fishes, which, like cod, mackerel, herring, etc., are the most important of our sea fishes; which form the largest quota

of our fish exports and are generally called commercial fishes,—without going so far as to pretend that protection would be useless to them,—I say that it is impossible, not merely to exhaust them, but even noticeably to lessen their number by the means now used for their capture, especially if, protecting them during the spawning seasons, we are contented to fish them from their feeding grounds. For the last three hundred years, fishing has gone on in the Gulf of St. Lawrence and along the coast of our Maritime Provinces, and although enormous quantities of fish have been caught, there are no indications of exhaustion.

In England, a Royal Commission, under the presidency of Professor Huxley and composed of the most eminent learned men of the United Kingdom, have made a serious and thorough study of this question, and these gentlemen declare that, notwithstanding the enormous and continually increasing quantities of fish caught annually along the coasts of Great Britain, the English fisheries show no sign of exhaustion. In presence of these facts, and relying on the reports and studies of many eminent and practical men, we may infer that, unless the order of nature is overthrown, for centuries to come our fisheries will continue to be fertile and productive.

Messrs. Hatton and Hervey, in their interesting "History of Newfoundland," say: "The Arctic current which washes the coasts of Labrador, Newfoundland, Canada and part of the United States, chilling the atmosphere, and bearing on its bosom huge ice-argosies, is the source of the vast fish-wealth which has been drawn on for ages, and which promises to continue for ages to come. Wanting this cold river in the ocean, the cod, seals, herring, mackerel, halibut, etc., which now crowd the northern seas, would be entirely absent. The great fishing interests are thus as dependent on the Arctic current as the farming interests on the rain and sunshine which ripens the crops." These writers add that "the cold current brings with it the food on which these fish thrive and *the supply is one that can never fail.*"

The Arctic seas, and the great rivers which they send forth, swarm with minute forms of life, constituting, according to Professor Hind, in many places a living mass, a vast ocean of living slime. The all-pervading life, which exists there, affords the true solution of the problem which has so often presented itself to

those engaged in the sea fisheries, viz., the source of the food which gives sustenance to the countless millions of fish that swarm upon the coasts of Labrador and Newfoundland and in the Dominion and United States waters. Dr. Brown has shown that the presence of this slime, spread over one hundred thousand square miles, provides food for myriads of birds that frequent the Arctic Seas in the summer and also furnishes sustenance to the largest marine animals up to the giant whale. By far the largest area of this cold water subtends the coasts of the British American Provinces within the hundred fathom line of soundings. It is computed that while the cold water area subtending the United States is about 45,000 square miles, that subtending the British American shores is 200,000 square miles. To this fact is traced the superior value of the fisheries of British North America.

The old theory regarding the extended migrations of the cod, the herring, etc., to the Arctic or other distant regions and back, is now entirely exploded. These fishes are known to be local in their habits and to be confined to a limited area in their movements. These are governed by the presence or absence of food, their spawning instincts, and the temperature of the water. The law which governs fish life is, that they return to the place of their birth for reproductive purposes. Hence, all round the coast there are, at different places, what may be called colonies of fish differing from each other, and each having a range of movement from the deep to the shallower waters and *vice versa*. To the spot where the young first issued from the ovum they return, when mature, to repeat the story of their birth. Further, in passing from the spawning grounds to the deeper waters where they spend the winter, the cod and other fish follow a definite line of migration, and generally the shortest and most direct route. Thus the fishes taken along any stretch of coast line, are really indigenous to the adjacent sea area.

IV. OUR MOST IMPORTANT FISHING GROUNDS.

The fisheries of Canada may be divided into two great classes: the deep-sea fisheries; and the fresh-water, or lake and river fisheries. We shall give the precedence to the former as being the most important. Only about one-half of our five thousand

miles of sea coast has till now been properly worked. We do not know yet all the riches of the British Columbia waters, but one can infer, from reading the official report, that they are teeming with a great variety of commercial fishes.

Our most important deep-sea fishing-grounds are the Atlantic coast of Nova Scotia, from the Bay of Fundy, around the southern part; around the coasts of Cape Breton, New Brunswick and Prince Edward Island; embracing the Bay of Chaleurs and the Gaspé coast, and extending to the Island of Anticosti, the Labrador and the Magdalen Islands. "There is probably no part of the world," says P. L. Simmons, in his valuable work on the Commercial Products of the Sea, "where such extensive and valuable fisheries are to be found as within the Gulf of St. Lawrence. Nature has bountifully provided within its waters the utmost abundance of those fishes which are of the greatest importance to man, as affording not only nutritious and wholesome food, but also the means of profitable employment."

V. THE COD FISHERY.

Of all the deep-sea fisheries of Canada, the most important is the cod fishery, which furnishes employment to thousands of men and contributes most largely to our exportation trade. It is one of the leading industries in Nova Scotia, New Brunswick and the lowest part of the Province of Quebec.

The quantity of codfish taken by the Canadian fishermen, and prepared for the trade last year, was 1,611,596 quintals, representing a value of \$6,366,000. To this must be added 245,453 lbs. of cod and hake sounds, and 333,310 gallons of cod oil, valued at \$225,555; making a grand total of \$6,591,555 divided as follows between the different Maritime Provinces:—

Nova Scotia	\$3,977,599
Quebec	1,778,290
New Brunswick.....	716,496
Prince Edward Island.....	119,170
	\$6,591,555

The cod appears on the Canadian coasts at uncertain dates, generally between the middle of May and the beginning of June,

sometimes in the latter end of the month of April. Local variations in the time of its arrival amounting to days and even weeks frequently occur, and these are dependent on the temperature, which determines the movement towards land of the various forms of marine life on which the cod feeds. "It has some favourite spots," Dr. Fortin remarks, "where it is found in greater quantities. These are the places which present the best advantages for the preservation and hatching of the spawn. Having deposited its spawn, it withdraws to shallow places called banks, where it always finds food in sufficient quantity to satisfy the well known voracity of its appetite." About the month of December, the codfish appear to leave the shallow soundings and the banks inshore and go farther out at sea.

The cod-fishing season varies with the different Provinces, beginning earlier in Nova Scotia and New Brunswick, where the climate is not quite so severe as in the Province of Quebec. From April to November inclusive may be given as an average time. The arrival of the cod on the coasts in the spring is heralded, first by the herring, and secondly by the caplin. The latter is a small fish, the favourite food of the greedy cod, and therefore the best fishing bait. In every large fishing establishment, during all the month of June, two or three boats, each of them manned by seven men, called *seiners*, are employed, day and night, in going about the coast in search of the caplin. When they meet with a shoal of these fish, they cast the seine, load their boat, and hasten home to distribute these little fish amongst the fishermen. Each cod-fishing boat receives an equal share of the fish thus brought by the seiners. Vessels engaged in fishing on the Banks, run into the harbours at intervals for fresh supplies of caplin as bait, which they preserve in ice.

Some idea of the immense shoals of caplin that fill the bays, may be formed from the fact that a man standing ashore, with a casting net, will often fill a cart in less than an hour. With small seines, a couple of men can fill a small boat in about the same time. If any means could be devised to cure them like sardines, which they resemble, caplin would become of considerable commercial value, as they have a very delicate flavour when fresh. In some parts of the Dominion a considerable quantity is dried, packed up in small boxes and sent to some of

the United States markets. After the caplin has disappeared from the coasts about the end of June, the launce, the herring, the mackerel, the squid, the smelt, the clams, etc., are used as bait for the cod.

Our cod being mainly taken by hand-lines, and *bultows* or set-lines, the cost of bait for cod-fishing is great. It is certainly not an exaggeration to estimate the actual cost of bait at one-fourth of the value of the cod taken. Besides this, much time is lost every year during the fishing season owing to want of fresh bait, which is not always easily procured and which is essential to good fishing. Hence anything that should economize the cost of bait and save time, would be both desirable and important. Norway, the most important of the cod-producing countries of Europe, and our chief rival in the cod markets of the world, by the aid of science, has in recent years greatly improved her modes of fishing, her fishermen using gill-nets to a large extent and with great success. Why do we not imitate such a good example?

According to recent statements, of 26,000 fishermen engaged in cod-fishing off the Lofoden islands, 12,000 fished with gill-nets; and fishing with nets has proved to be much more productive than fishing with set-lines or bultows. A paper of Gloucester (U. S.) records that on December 12th, 1882, a fishing boat with two men and seven of these nets took 5,000 fish in a single night. Mr. James Feehan, of Prince Edward Island, stated that "in his hands gill-nets have worked admirably, to the extent of two dory loads of fish per day." Let us, therefore, hope that gill-net fishing, so remunerative in other countries, will soon be largely used in Canada, and thus save time and the waste of a large quantity of herring, mackerel and other fishes now used for bait.

The cod fishery is carried on in Canada, either in vessels of a tonnage from 60 to 100 tons on the great banks, or in open boats at a few miles from the shore. Nova Scotia and New Brunswick seem to have the monopoly of the fishing in large decked vessels, and I am happy to say that naval architecture has improved very much, during the last ten years, in these two Provinces; and this improvement in the dimensions and lines of their vessels, has enabled their fishermen to increase their annual catch of fish considerably.

Vessels employed in cod-fishing are manned by from ten to

thirteen men, according to their tonnage. Generally the owner of the schooner, who also supplies the men with all the necessary fishing tackle, receives half the catch, the fishermen retaining the other half. "When the vessels have reached the fishing grounds," writes Dr. Fortin, "they are anchored by hemp or manilla cables in from fifteen to fifty fathoms of water. Bait is obtained by spreading nets in the sea at some distance from the vessel, and the fishing is then begun, with bultows or long lines, and carried on, by night as well as by day, in spite of wind and storm, until the hold of the vessel is filled up with fish all split and salted. Then the vessel returns to port, the cod is landed, washed, dried, and prepared for exportation."

Fishing in vessels is more expensive, but also more remunerative, than fishing with open boats along the shore. The cod taken on the Banks is larger and finer in quality than the fish taken along the coasts. An average of thirty bank cods, when dried, makes a quintal, and it brings a higher price than the shore fish.

In the Province of Quebec and in Prince Edward Island, the cod fishery is still almost universally carried on in open boats, in the neighbourhood of the coves and bays where the fishermen reside. In some parts of the Province of Quebec, however, fishermen venture with their open boats to twenty and thirty miles from the shore. These boats are built by the fishermen themselves. They vary in dimensions from twenty to thirty feet keel, with a breadth of beam of from six to ten feet, according to the use they are intended for. They are very sheer built, and their clinker work is usually of cedar. Pointed at both ends, their rigging consists generally of two sprits or gaff-sails; some of those intended to fish on the Banks being schooner-rigged. They are comparatively light, in order to be easily hauled up on the beach in stormy weather; are good sailers and behave wonderfully well at sea. Yet, although good sea boats and splendid sailers, manned by fishermen whose intrepidity and skilfulness are well known, these boats are too small to enable our fishermen to carry on cod-fishing upon as large a scale as it might be done. The fishermen of Quebec and Prince Edward Island with their small boats,—being too often obliged to run before the storm and leave the fishing grounds when they are sure of a good catch, in order to save themselves from being caught away from land by

heavy gales,—lose every year much precious time during which the fishermen of Nova Scotia and New Brunswick reap an abundant harvest. The Reports on the fisheries of the last few years show a noticeable diminution in the quantity of fish caught by the fishermen of the Province of Quebec, and this deficiency was due to no other cause than the frequent storms which raged in the Gulf of St. Lawrence during the last few years. The summer fishing has been a failure this year again owing to the same cause, though there was fish in abundance.

Though the official Reports show an annual increase in the catch of codfish, we may safely say that, considering the increasing number of fishermen, the development of this fishery is stationary. And this condition, as remarked by Messrs. Hatton and Hervey before referred to, is not caused by the falling off in quantity of the cod, but is largely due to the imperfect methods of taking them which still prevail. If we except a few enterprising men in the Maritime Provinces, the merchants, as a rule, are apathetic and show no desire to procure information respecting what other countries are doing, or to induce their fishermen to use improved fishing gear. Science is not called in to aid this important industry in Canada, as it has been in the United States and in Europe. Above all, the vicious supply system, still more or less in force in the different provinces, by which advances in food and clothing are made to the fishermen at the commencement of each season, is destructive to the industrious efforts of men who are thus rarely out of debt.

I certainly do not wish to insinuate that the condition of our fishermen is worse than that of fishermen elsewhere; for this "supply" system is necessary to the working of fishing industries in every part of the world. But if we had in Canada a well-organized Fishery Bureau, under the guidance of skilful scientists and practical men, and if the improvements of other countries were introduced here, our cod fishery, as well as our other fisheries, through the application of skill and capital, might be indefinitely increased. Capitalists, who should invest capital in this industry, would be always sure of a good market for their produce. The dried cod is regarded as an indispensable article of food by the inhabitants of warm countries. Every year we supply the Catholic countries of Europe and America with millions

of dollars worth of dried codfish, our principal markets for dry codfish being Italy, Spain, Portugal, Brazil, the British and Spanish West Indies and United States.

The finest cod in all America is cured on the coast of Gaspé, in the Province of Quebec, where the effects of the mists generated by Gulf stream are least felt. It is well known in the markets of Spain, Italy and Brazil, where it is generally sent,—the large fish going to the Mediterranean countries in bulk in vessels from one hundred to three hundred tons, and the small fish to Brazil in drums containing 128 pounds.

During the time that the fish is exposed on the "flakes" to dry, if the weather is fine, the sun shining, the westerly winds predominating, cod is easily cured and made of fine quality; but, sometimes, easterly winds prevailing, rain lasts for weeks, and in spite of all possible care and precaution, it is inevitably spoiled. So, before sending it to the markets, the fish is carefully culled, the greater part of the best quality being sent to Europe and Brazil, and the inferior to the West Indies and United States markets. Nova Scotia, New Brunswick and Prince Edward Island export chiefly to the West Indies, United States and Brazil; Quebec to Brazil, the Mediterranean countries and the West Indies.

According to the last statistics which we have on the matter, the West Indies have paid us for dried codfish \$2,000,000; Brazil and Europe, \$500,000 each; the United States, somewhat over that sum; and British Guiana, \$250,000.

VI. INDUSTRIES OF THE COD FISHERY.

The cod is the most useful of all fish: no part of it is valueless. Oil is taken from its liver; the head, tongues and sounds form a good article of food; the offal and bones, when steamed, dried, and ground, are converted into a very good manure, equal as a fertilizer, to the celebrated Peruvian guano. The roes are a splendid bait for the sardine fisheries of France and Spain; and from the swimming bladder isinglass is made.

Great Britain bought from us last year \$150,000 worth of cod oil, and cod tongues and sounds to \$125,000. The manufacturers of fish manure, in Nova Scotia, New Brunswick and British

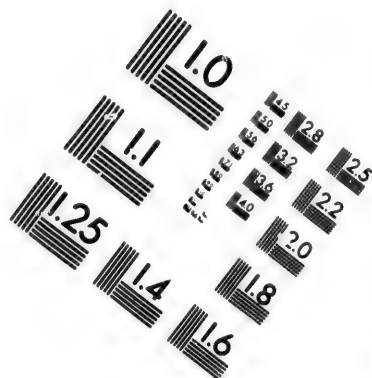
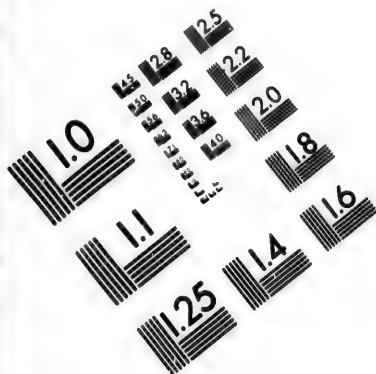
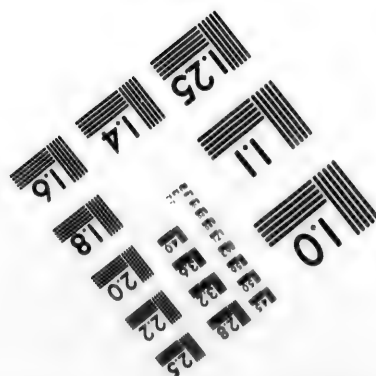
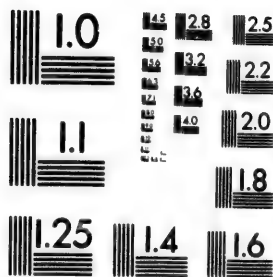


IMAGE EVALUATION TEST TARGET (MT-3)



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Columbia, have produced this commodity to the amount of \$80,000. I regret to state that the Province of Quebec has not yet a manufacture of guano. Thousands of tons of fish offal are, every year, thrown away and wasted, which could be converted into fish manure worth from \$28 to \$40 a ton in the foreign markets. If manufactures of fish guano were built on the coasts of Labrador and Gaspesia, the manufacturer would realize handsome profits, and the fishermen, without much extra work, could dispose of products that are now wasted.

What I have just said about fish offal may also be said of the cod roes which are not exported, although this article can be sold at a good profit. In France and Spain, where sardines and anchovy fisheries are carried on, at least 50,000 barrels of cod roes are wanted every year as bait for these fishes. In very good fishing years, Norway can supply the French and Spanish markets with about 35,000 barrels of roes. But this is the largest quantity which that country can give; and during 1831, 1882 and 1883, Norway could only sell 25,000 barrels. There would then remain an average of 20,000 barrels of cod roes which could easily be furnished and sold by Canadian fishermen. When they cannot get the roes, the sardine fishermen are obliged to use costly chemical compositions as substitutes. Let us note here that a barrel of well-prepared cod roes is generally worth \$10 in the French markets. If we multiply twenty thousands barrels by ten, we have a sum of \$200,000 annually thrown into the sea by our fishermen, because the trade has not been opened in Canada. A few years ago, French vessels travelled all along the Canadian fishing coasts and bought all the cod roes they could get; but the want of experience of our fishermen in the salting of roes, and especially the absence of any law obliging this article to be inspected before being packed for exportation, caused a very inferior article to be furnished, and put an end to a trade which promised handsome profits.

Lastly, as to the industries connected with rope, cordage, line, nets, hooks, cooperage, etc., our country has up to the present moment bought, from Great Britain and the United States, all the fishing gear which our fishermen required. Now manufactures of this kind are wanted in Canada, and would prosper well here. We have only to give them the million dollars

that we spend in buying nets and other fishing gear. Let me add also this very important consideration : that the manufacture of fishing tackle on our coasts would give work to thousands of hands, and would prevent many of our countrymen from emigrating.

VII. THE HERRING FISHERY.

The sea fishing next in importance to the cod fishery in Canada is the herring fishery, the value of which, without taking into account the local consumption and the quantity used as bait for the cod fishery, and for manure in many parts of the Dominion, was, according to our last statistics, represented by the sum of over \$2,135,000. This amount is a large one, and the result seems handsome, but it is certainly not in relation with the abundance of this fish in Canadian waters. The herring fishery is far from getting here all the attention it deserves ; and I might even say that we have no *regular* herring fishery in Canada. It is true that in Nova Scotia, New Brunswick and Prince Edward Island, schooners are especially fitted out for this fishery ; that it is regularly and intelligently practised by a large number of men from those Provinces, bringing them handsome returns : still all these endeavours, although very laudable, are nothing but isolated undertakings.

It will perhaps surprise a good many of my readers, to learn that the whole of the Province of Quebec,—possessing 10,000 fishermen, 1,100 miles of maritime coasts, numerous bays famed for the abundance of herring repairing to their waters,—does not annually export two thousand barrels of this fish. Although they could derive immense benefits from the working of the industry, the Quebec fishermen are satisfied when they have taken enough fish for their own consumption and for the wants of the cod fishery.

The reason of this apparent neglect lies in the fact that the Quebec merchants give all their time and attention to the cod fishery. And, nevertheless, it is almost impossible without seeing it to form a correct idea of the immense quantity of herrings that visit the coasts of the Province, especially in the spring during the spawning season. Their compact masses

cover thousands of acres of the sea; so that, if the fishermen were provided with the necessary fishing appliances, if they had a ready market, they could easily, in a few days, even before the beginning of the cod fishery, catch enough herring to realize thousands of dollars. Out of the \$2,135,283 produced by our herring fishery in 1883, Nova Scotia, New Brunswick and Prince Edward Island, have \$1,750,000; Ontario, \$86,000; and British Columbia, \$14,000,—leaving to Quebec a ridiculous proportion compared with the extent of its maritime coasts.

A regular fleet of vessels from thirty to ninety tons is used, in England, in the herring fisheries, which give employment to about 80,000 men, and in which English capitalists have invested enormous sums of money. The European fishermen, provided with good and improved fishing gear, and manning large and safe sea boats go out fifty, sixty, and even one hundred miles if necessary in search of shoals of herring. In Ireland, Scotland, England, France, Holland, etc., a herring-fishing craft costs, including the necessary fishing tackle, from \$5,000 to \$7,000. The returns of the herring fishery, properly made, must be very large in those countries, since they not only cover the immense disbursements necessary to carry it on, but bring in important profits. And yet the herring fisheries of Europe are not as rich or abundant as ours.

I assert with confidence that if, in Canada, this industry were carried on upon a scale proportionate to its importance and the abundance of herring in our waters; if companies were formed to provide our fishermen with boats and fishing implements like those used in Europe, our herring fishery, instead of two, would bring every year five or six millions of dollars. Nor are markets wanting for this fish, which is cheap and can be bought by the poorest; for, besides our own market, we should have those of the United States, of England, Germany and the West Indies. The population of Europe and South America is growing rapidly, and the products of the fisheries of these countries are far from being abundant enough to meet the demand. We have there an almost unlimited market for our pickled fish, provided it be carefully prepared and packed.

As soon as the ice has disappeared from our coasts in the spring, herrings arrive in immense shoals remaining in our

waters till the month of December. A considerable quantity is even taken during the winter months, along the southern coast of New Brunswick and Nova Scotia. The spring herrings are not as valuable as those caught from the month of August to the month of December. The former are packed in barrels of two hundred pounds and sent to the West Indies; while the fat fish, caught in the latter end of the season, are carefully gutted and prepared for the United States and European markets,—our best being the celebrated Labrador herring. For the last few years, small herrings have been successfully prepared in boxes like sardines, and this new trade is rapidly increasing. A breakfast delicacy, well known to epicures in America as well as in Europe, is the bright golden Digby Chicken,—a small smoked herring prepared in Nova Scotia. We exported last year 170,000 boxes of this much appreciated article of food.

Canada furnished, in the year 1882, the following quantities of herring to the foreign markets:—

Pickled, 423,042 barrels.....	\$1,739,943
Smoked, 1,060,416 boxes.....	311,807
Fresh, 16,050,000 pounds.....	83,533
	\$2,135,283

All the fresh herring figuring in the above statement is sent from Nova Scotia and New Brunswick to the United States, and the largest quantity of the pickled and smoked herring is also exported from these two Provinces to the United States, West Indies and English markets; but, as I have said already, the amount of our exports of herring could be easily doubled.

VIII. THE MACKEREL FISHERY.

I am happy to say that our energetic and progressive neighbours to the south, have no longer the almost exclusive monopoly of mackerel fishing in the Canadian waters,—a monopoly that they have enjoyed for a number of years. Wearied with beholding the success of the Gloucester fishermen, who, year after year, come to our own doors to reap an abundant crop, the fishermen of Nova Scotia and New Brunswick set to work and have

succeeded very well. They are to-day carrying on mackerel fishing on a large scale, and deriving good profits from it. They can show a fine fleet of vessels, so improved in symmetry as to bear fair comparison with the American schooners, which are reputed to be the finest vessels and the best sailors of their class in the world. Nor are they merely the owners of splendid vessels fitted out with the utmost care. They have adopted the most modern fishing appliances and are prosecuting this industry with great tact and intelligence: for the mackerel fishery is difficult, precarious, and uncertain. A schooner may cruise in the Gulf for a week without taking a single fish, while another gets filled in the space of a fortnight and sometimes less. It requires, therefore, to be carried on with sagacity and perseverance, — two qualities which distinguish the fishermen of our Maritime Provinces; but, then, it is generally successful, brings in large profits, and is certainly worthy of the attention of capitalists. It is to be hoped that many years will not elapse before Quebec, which up to this date has given little or no attention to this fishery, will also have her fleet of mackerel-fishing vessels.

The tourists who, during the dog days, run away from the heat of our cities to breathe the pure and vivifying air of the Gulf of St. Lawrence, and make the journey by water, have often, in the course of their visits to the Maritime Provinces, met with fine mackerel schooners, and mistaken them for a small squadron of yachts, so beautiful are their masts and sails, so neat and clean are they kept. But, writes Dr. Fortin, "on a nearer approach, this is found to be an error; for on the decks of these vessels are to be seen crews of from ten to twenty men, all occupied either in catching fish, in repairing fishing implements, or in splitting and salting the fish that has been taken; and what is more striking is the order that reigns on board these schooners, whose decks and holds are almost always full of fish, fish barrels, salt, etc. These schooners are generally of from sixty to one hundred tons burden. They have little depth of hold, great breadth of beam, rake very much fore and aft, and carry large cotton sails which enable them to sail fast even with a light breeze. Their decks are roomy and on them the whole work of salting and barrelling is carried on."

Hook and line, ordinary seines, and purse-seines are used in

fishing mackerel in the Gulf. Gill-nets, smaller seines and traps serve the same purpose in the bays, coves, creeks and inlets along the coasts. Mackerel is met with off the coast of Nova Scotia, in the Bay of Fundy, in the Gulf of Canso; but nowhere is it more plentiful than in the Gulf of St. Lawrence, off the coast of Prince Edward Island, in the Bay of Chaleurs and in the numerous coves and bays formed by the Magdalen Islands.

The mackerel is one of the most valuable fish visiting the Canadian coasts. A good proportion of our catch is sent fresh to the markets, some in tins, and the largest quantity pickled and packed in barrels. Our best market for either fresh, canned or pickled mackerel is the United States, although Great Britain and the West Indies also buy some of it. From the last statistical returns, we see that the mackerel fishery produced \$1,250,000; but it could certainly afford employment to many additional vessels and employ thousands of additional hands.

IX. THE LOBSTER AND OYSTER FISHERIES.

It seems to be the tendency in this age of competition to overdo any business which promises to be lucrative. "Not more than ten years ago," writes Mr. Hunter Duvar, in his Report to the Minister of Marine and Fisheries in 1879, "when the retail price of lobsters was two or three for a half-penny, a New Brunswicker came to Prince Edward Island and commenced the business of preserving in tins. Attracted by his success, a few other persons engaged in the same pursuit. The business gradually augmented until three or four years since, when it became endued with much more life and has, at length, sprung into great dimensions." The following is a list of the number of cans put up for the market in Prince Edward Island:—

1871.....	6,711
1875.....	151,248
1876.....	362,676
1877.....	663,900
1878.....	1,649,800
1879.....	2,272,825
1880.....	3,551,000
1881.....	5,200,000
1882.....	6,300,000

This Province, which in 1871 had only one lobster-canning factory, had, ten years later, in 1881, one hundred and twenty of these establishments in full operation. The same development of the trade happened in New Brunswick and Nova Scotia. In 1870, New Brunswick had only one factory, the owner of which prepared 20,000 cans of fish. Ten years after, 6,000,000 cans were sent from this Province to different foreign markets. Nova Scotia, producing only 30,000 cans in 1870, exported 5,000,000 in 1882. Quebec, far behind her sister Provinces in the prosecution of this industry, did not produce more than 800,000 cans last year.

If we recapitulate the above figures, we shall find that the lobster fishery, which was almost unknown in Canada ten years ago, is carried on to-day in more than 600 factories which, last year, sent to the different markets of the world 17,500,000 cans, representing a value of \$3,000,000, almost equivalent to the value of our herring and mackerel fisheries put together. These seventeen millions and a half of cans represent, at three lobsters to each can, 52,500,000 lobsters taken in the Canadian waters in 1882. The number of lobsters taken in all England does not exceed 3,000,000 each year.

This comparatively enormous development in the catch of lobster, in indicating the extent and richness of our lobster fishery, suggests also the danger of over-production, both of which facts point to the necessity of economizing and perpetuating the general supplies. "There is nothing easier," says Mr. W. F. Whiteher, who for many years has presided over our Fishery Department, "than to exhaust a shell fishery, but also nothing harder than to revive it; and the Government of the Dominion, alive to this fact, has taken measures to prevent any indiscriminate fishing of the lobster on our coasts. Doubtless, if the fishing that is now carried on was not subjected to regulations, all persons interested in it would prosper for a short time, and the country would appear to benefit by the rapid and extensive development of this resource, but a period of reaction would necessarily ensue."

I need hardly mention here that this industry is of considerable importance in the general economy of the Dominion. Every one understands that the erection of buildings, tin and iron work, boat

building, fuel cutting, truckage, etc., cause a large amount of money to circulate amongst our fishing population, and fair wages to be paid to thousands of hands, men, women and children.

Great Britain is our best market for preserved lobsters. We also export annually some 3,000,000 cans to the United States. France takes about 200,000 cans, and the remainder is divided between the West Indies, Germany, Brazil, and some other markets of South America.

A word about the Oyster fishery naturally finds its place here. This mollusc, so well known by epicures of all countries, is still comparatively abundant in Canada. In Europe, owing to its scarcity, it sells at a fabulous price, and wealthy people alone can indulge in this luxury, but on our coasts almost everybody can, from time to time, enjoy a good oyster soup.

We have the Malpeque, the St. Simon, the Caraquet, and many other varieties, deriving their names from the localities where the banks from which they are taken are situated. Oyster fishing is carried on chiefly on the coasts of Prince Edward Island and New Brunswick, and yields annually a round sum of \$200,000.

X. THE SEAL FISHERY.

The herds of seals that frequent the Gulf of St. Lawrence and the Atlantic Ocean arrive there in the month of November. They come into the Gulf through the Strait of Belleisle. They keep close to the coast of Labrador and Newfoundland, penetrating into all the bays and not going far out from land when doubling the points and capes. They are fond of approaching the shore, and landing on sandy beaches or flat rocks to bask in the sun; but at the slightest noise, and, especially if they perceive the fishermen, they make for the sea and disappear under its waters.

Seals are of great value, not only on account of the thick layer of fat between their skin and muscles, which yields an oil superior to that of the whale, but also on account of their skin, which tans well and makes an excellent leather. Their importance, from a commercial point of view was soon perceived by the first mariners who visited the Gulf of St. Lawrence, for, no sooner was Canada discovered, than the seal fishery was prosecu-

ted on our coasts, and, if we are to believe the accounts which have come down to us of several voyages to the coasts of Labrador during the last century, immense numbers of them were taken at that period.

Then, as now, nets were used for the purpose of capturing these marine animals. These nets are made of a hempen cord, which is very strong, although not more than the twelfth part of an inch thick. The meshes are eight inches square and will admit the head and neck of the seal. Some of these nets are more than six hundred feet long by sixty feet wide. The usual time for the seals to pass near the shore on their migratory voyage being known, the nets are set a few days before. One of the fishermen is posted as a sentry on a rock a little in advance of the fishery, to give notice of the approach of the herds of seal, and the moment that any appear in the fishery, the signal is given, and the fishermen hasten to raise, by means of a capstan, a net sunk by weights to the bottom of the water at the entrance of the fishery. With this net they close the opening through which the seals made their ingress; and as soon as this operation is completed, and the seals are fairly imprisoned, the fishermen jump into their boats and enter the fishery shouting and beating the water with their paddles. The frightened seals, trying to escape, dive down and run their heads into the meshes of the nets, which are kept open by means of cables round their borders. As soon as the seals are caught in the meshes, the men under-run the nets, knock on the head those that are not strangled and carry them all on shore in their canoes.

The autumn seal fishery takes place at the end of November and in December on the coast of Labrador, and is very arduous, owing to the severity of the cold at that season. The seals are no sooner taken out of the water, than they become frozen; and in that state they are put into stores, and it is not until the spring, when the weather has softened them, that they are cut up and their fat melted.

But it is not only near the shore in nets, after the manner I have just described, that the seals are taken; they are also pursued in every direction, and are sought for on the ice-fields, not only in the Gulf of St. Lawrence, but even in the North Atlantic Ocean. Strong sailing vessels and steamers specially fitted out for this

latter kind of fishing, or rather hunting, start early in the month of March, in order to find the seals on the ice-fields; for, when once they get into the water, they can set the most experienced men at defiance, and it is useless to pursue them.

The inhabitants of Labrador and the Magdalen Islands are the only fishermen in Canada who bestow any attention upon the seal fishery, which certainly would yield large profits to all who should invest in it. Newfoundland carries on the seal fishery on a large scale. Ten thousand of her fishermen are employed in it. The Newfoundland capitalists, whose spirit of initiative and of enterprise is well known, have replaced the sailing vessels formerly in use, by a splendid fleet of steamers which have the advantage over sailing vessels of making and completing two trips instead of one.

Notwithstanding the heavy expenses which must necessarily be incurred in carrying on this fishery, its returns pay so well, that experienced and competent business men assure us that capital invested in it will generally bring twenty-five and sometimes forty per cent. Every spring we see in the newspapers that the Newfoundland steamers are back from the ice-fields, some with from 10,000 to 20,000 seals, others with from 20,000 to 40,000 each. And each seal, oil and skin, is worth on an average \$3. In 1883, Newfoundland exported seal skins and seal oil to the amount of \$1,080,000, while Canada did not go much beyond \$200,000. And yet this industry could produce as much in Canada as in Newfoundland, if our business men would give their attention to it.

XI. FRESH-WATER FISHERIES: SALMON.

Although not quite as important as our deep-sea fisheries, from a commercial point of view, the fresh-water fisheries of Canada are nevertheless most valuable. Without taking into account the \$3,000,000 which they furnish annually to our export trade, they are the chief source from which those, who live on the shores of our large lakes and by our principal rivers, get their daily food and supply our markets of the interior.

Salmon is considered the best, and is called the king of fresh-water fishes. Abundant enough still in the rivers of the Dominion,

you meet him alike in the cottage of the poor, and in the mansion of the rich. Our rivers which were formerly renowned for the large quantity of salmon found in them, are not now so well stocked with this fish, owing to an indiscriminate fishing at all seasons of the year, and to the want of proper laws for its preservation.

Many persons will perhaps be tempted to ask how it is that within the last ten years, in spite of the judicious regulations limiting the salmon-fishing to certain seasons of the year, and prescribing the size, kind, and number of fishing implements that may be used; in spite of the Government's endeavors to replenish our rivers, and though we are spending thousands of dollars, every year, to help the natural propagation by artificial breeding; in presence of the fact that, from twelve or thirteen fish-breeding establishments under the control of the Government, millions of young fish are yearly distributed in many of our rivers,—yet there is no marked increase in the annual catch, but rather a tendency to a gradual decrease. My own opinion is that more protection should be given. More and better-paid guardians should be appointed, and we should try to stop the destructive work of the numerous marauders who, every fall, enter our best rivers, and kill thousands of salmon on their spawning beds. I am of opinion too, that the present fly-fishing season is too long. Though I have heard the Superintendent of our fish-breeding establishments say that fly-fishing was in reality helping the propagation of the salmon; and although I have the greatest respect for the scientific and practical knowledge of this gentleman, I firmly believe that if the angler was obliged to put up his lines on the same day that the salmon fisherman is forced by law to raise his nets and leave a free passage to this fish, great benefits would be derived from such regulations.

Those who live by salmon-fishing, and who furnish to our export trade millions of dollars worth of this fish, are obliged by law to take away their nets at a given time,—at the end of July, in the Province of Quebec, and later in New Brunswick and Nova Scotia,—while the angler, who has no other object in view than sport and pastime, is allowed to fish till September 1st, and even till October 15th. This certainly appears to be an anomaly. The salmon, which have succeeded in avoiding the nets at or near the

mouths of the rivers, and go up them to reproduce their species, fall a victim to the skill of the angler. Hundreds of salmon, which would have reproduced thousands of others, are destroyed every year in this manner. I have heard many experienced gentlemen express the opinion that, if greater protection were given to the salmon fishery, we should not be obliged to make extreme and costly endeavours to arrest its decline,—endeavours, the practical results of which are yet far from being well ascertained.

I should not like, however, to convey the idea, that our salmon fishery is exhausted. Far from it. It has somewhat decreased in abundance, compared with what it was twenty or thirty years ago, but it has still considerable importance, as will be shown by statistics, and is a source of wealth to many of the inhabitants of the Dominion, besides affording splendid sport to a number of wealthy gentlemen from Europe and America, who visit our rivers every summer to enjoy the pleasure of salmon fly-fishing. In 1882, Canada supplied the foreign market with \$3,000,000 worth of fish, either fresh, canned or pickled. The United States take most of our fresh salmon, and Great Britain the largest proportion of the fish preserved in tins. Pickled salmon goes mostly to the United States. Attempts have already been successfully made to send fresh salmon from Canada to England, and I have no doubt a greater quantity of it will now be sent over every year. And, before many years have elapsed, when means of transit will exist between our cities of the interior and the fishing coasts, the fresh salmon trade will attain proportions hitherto unknown.

British Columbia, of all the Provinces of the Dominion, is the most celebrated for its salmon fishery, and, within a few years, this industry has attained almost colossal proportions. The catch which, in 1879, was only 3,000,000 lbs., had in 1882 risen to 12,000,000 lbs., showing an increase of nine millions in three years. And yet, says Mr. Anderson, Inspector of Fisheries for British Columbia, "the canneries of this Province, notwithstanding the abundance of fish, could not be worked up to their full capacity, owing to the deficiency of labour arising from the increased demand for railways and other purposes." I find in the last statistics which we have on this subject, that 15,220,000 lbs. of salmon were taken out of Canadian waters in 1882. Calcu-

lating every fish taken at an average weight of fifteen pounds, this will give us 1,014,600 salmon caught that year, and the statistics for 1883 will certainly show an increase on the above figures.

Let us hope that the British Columbia fishermen will be wise enough to economize by a judicious fishing the source of wealth they have in their salmon rather than be obliged, later on, to try to restore it from exhaustion. This idea is suggested by the fact that the question of establishing a salmon hatchery on the waters of the Fraser River, one of the best salmon rivers of the Province, is already agitated. The capital invested in the salmon fishery of Columbia River in 1882, as given by the trade report, is estimated at over \$2,000,000, and employment was given to more than 7,000 men; while Mr. A. C. Anderson writes that, "in addition to the quantity of salmon canned for exportation during the past year in British Columbia, a little over 5,000 barrels of salted salmon have also been packed in pickle. The demand for the fish so cured, appears to be rapidly increasing; and there can be little question that, with due care in the preparation, the barrelled salmon of this coast will soon attain a world-wide reputation. In this branch of industry less capital is required than in the prosecution of the canning business, and a broad field is thus opened for the industrious fishermen of moderate means..... Everything indicates the expansion of the British Columbia fishing interest, the great value of which is gradually being recognized. The rapid advance of the Canadian Pacific Railway warrants the assumption that, ere long, direct communications with the eastern Provinces will be available, and it is easy to conceive, at least partially, the impetus which this much-desired communication will give to all the industries of the Pacific coasts." (Report of 1882.)

XII. TROUT, WHITE-FISH, ETC.

Trout of all kinds abound in every Canadian river, and the best are the sea trout and the salmon trout. White-fish and trout fisheries are carried on on a large scale, chiefly on the lakes of Ontario. The area covered by Lake Superior alone is thirty-one thousand square miles, and Lakes Erie, Huron and Ontario

form, when put together, an expanse of fifty-two thousand square miles. Many rivers empty their waters into these inland seas, and these rivers, as well as the lakes themselves, are full of different kinds of food fishes, the delicacy and flavour of which are well known. The Ontario fisherman has the salmon trout, weighing as much as eighty pounds, and the white-fish, the flavor of which is considered equal to that of the salmon. The sturgeon, the pickerel, the pike, the bass, the perch, etc., form other varieties of fishes found in Ontario.

The fishermen of our Canadian lakes use gill-nets and trap-nets, and their vessels are either sailing boats of from twenty to thirty feet in length, or small steamers called "fishing tugs." Two models of these small steamers were much admired last year at the London Fisheries Exhibition. Those fishing tugs are generally fifty feet long and have twelve feet beam. They are the property of fish merchants, who hire men to fish for them on wages without any share in the profits of the industry. Sometimes they will receive a bonus from the proprietor in cases of successful catches. The great advantage of those tugs over the sailing boats is easily seen. While some of the men on board are busy taking in the nets set the day previous, the others are engaged in setting out clean nets. These two operations finished, the tug hastens to the nearest railway station, and the fish just caught is immediately sent by the cars, in refrigerators, to the Canadian and American cities. Besides, on calm days, or when the wind is blowing too hard to permit the sailing boats to go out, the steamers can always reach the fishing grounds. The amount of white-fish, trout, etc., taken from the lakes and sent fresh to the market in 1882, amounted to 4,500,000 lbs. But, besides this, there were salted, of white fish, 5,079 barrels; of trout, 9,758 barrels; of sturgeon, bass, pike, maskinonge and other kinds, 41,360 barrels: Total, 56,197 barrels. If this sum be multiplied by 200, the number of pounds in each barrel, we get a product of 11,239,400 lbs., which added to the four millions and a half already mentioned, will give the large amount of 15,739,400 lbs. for one year. As farmers chiefly compose the population of Ontario and as, comparatively speaking, very little capital is invested in lake fisheries, we are safe in asserting that the amount of fish now caught could be doubled or even trebled, if a larger

number of men were employed in the development of this industry. Besides this produce of the fresh-water fisheries in the Province of Ontario, we have other fisheries in the Maritime Provinces, such as the Smelt fisheries which, during the winter months, employ many hundred men and produce annually \$200,000. The annual yield of the Alewife fishery is \$185,000; of the Shad fishery, \$105,000; of the Eel fishery, \$80,000; of the Winnonish fishery, \$15,000; of the Sardine fishery, \$175,000, besides others. I may add, however, that the fresh-water fishes of the Dominion, though sold generally at a low figure, produced according to our last statistics, the sum of \$4,000,000.

The ease with which fish is attainable all through Canada has proved a special inducement to the poor of other countries to emigrate to our shores. They may be sure, to begin with, of having, at no expense except the trouble of fishing for it, a substantial and wholesome article of diet. This, with the possession of a farm sold by Government at a merely nominal price, with sobriety and economy, is sure to lead them within a few years to comfort and prosperity.

XIII. TELEGRAPHIC SYSTEM AND FISHING BULLETINS.

We owe to the exertions and perseverance of the Hon. P. Fortin, M.P. for Gaspé, the telegraphic communications established at a great cost in the Gulf of St. Lawrence, by the Canadian Government, to help our mariners and our fishermen. This telegraphic line, which embraces 27,000 square miles of our best fishing grounds; which connects together our most important fishing stations, and is connected with the whole systems of beacons, lighthouses, etc., was pronounced, by the jury of the Fisheries Exhibition held in London in 1883, to be the most perfect of all those actually existing, and has obtained the honors of a gold medal and of a special mention. This telegraphic system, contributing in a great measure to render navigation in the St. Lawrence Gulf and River more secure, has had for its immediate effect a considerable reduction in the rates of insurance and the advancement of trade generally. To the fishermen and to the fisheries it has proved of great importance. Every day, in all the offices, are posted up and distributed fishery bulletins indicating the

probabilities of the temperature for the next twenty-four hours, the presence of bait in certain localities, the movements of the shoals of fishes, the quantity taken of each variety, etc.

Mr. W. F. Witcher, ex-Commissioner of Fisheries for Canada, having been requested to give his opinion upon the advisability of establishing telegraphic communications along our coasts, wrote in 1876: "The pursuit of an industry such as that of fishing within nine hundred miles of coasts is necessarily attended by many dangers and peculiar drawbacks. Exposure of life and property is frequent. Success depends very much on the seasons. Many kinds of fish of erratic habits are eccentric in their movements. Plenty and scarcity may alternate in places, from which the settlers depending wholly on any fishery have no escape. Within twenty miles of a settlement, on a barren and uninhabited coast, the fish may strike and remain without any possibility of their whereabouts being known at other places; they may be abundant beyond the capacity of shoremen or vessels to catch them, and yet fishermen not far distant, may be unable to procure even sufficient for their winter supply. Vessels may return empty in one season from fishing grounds where, previously or afterwards, the fish abound. Some may lose the greater and best part of each season in searching after the shoals. Still the waters teem with fish, and sooner or later they approach the shore or frequent the shallows. It seems possible for the spirit of modern improvement to devise some means of providing against these vicissitudes. The plan which strikes me as the most feasible is a telegraphic system, connecting together the main fishing stations. The idea of signal stations, from which to observe and notify movements of fish, has been carried out to some extent in Norway, Holland, Germany, Sicily, and on the coast of Cornwall. It has proved of material assistance to the fishermen, and aided considerably in developing the fisheries of each of these countries. There is no doubt that it would prove advantageous to Canadian fishermen. Besides affording greater inducement and security to employers of capital, and inspiring confidence in those exposed to danger and hardships, it would undoubtedly enable us to increase production and enlarge our exports."

XIV. CONCLUSION.

I can not better end this essay than by quoting some remarks by P. L. Simmons, in his "Commercial Products of the Sea:" "The commercial products obtained from the sea," he writes, "are more numerous and important than would be generally supposed by those who have not looked closely into the matter. To a great part of the civilized world the taking of the cod, the herring, the salmon, the mackerel, the sardine, the seal and other fishes, is of great value and gives employment to hundreds of thousands of persons. The oil obtained from the seal, cod, shark, etc., is used for lamps, medicine and in industry. Many parts of fish are employed in the arts and manufactures,—as the scales of the bleak for making false pearls, and those of other fish for making ornaments; the skins of the seals and porpoises for tanning purposes. Isinglass is obtained from the air or swimming bladders of many. Fish roes are not only used as fish delicacies, but also for bait in some fishing grounds, and excellent guano is made from the offal and the bones of fish. The sea is more abundantly stocked with living creatures than the land. In all parts of the world a rocky and partially protected shore, perhaps supports, in a given space, a greater number of individual animals than any other station. The sea is filled with animals of several kinds, and each layer of water in depth, seems to have its own varieties, thus resembling the changes which take place, according to elevation, in the organized portions of the land. The animals are among the mightiest and among the smallest. There are swimming beasts, as whales, seals and walruses. There are fishes of various kinds and sizes, crustaceous, soft or jelly fishes, the molluscs, down to those creatures resembling live plants. All these are peculiar to the sea or the fresh waters; and the ocean has its marine plants,—sea weeds, which remain growing on the ground shoals or rise to the surface and then float. These too have many useful or economic applications."

The harvest of the sea has not yet been attended to and garnered to the same extent as that of the land. Some nations, such as the Chinese, have, it is true, long given close attention to the profitable utilisation of its commercial products; and several European nations and the Americans have also prosecuted certain

fisheries, but systematic and scientific arrangement has only of late years been specially directed to the various branches which have been termed pisciculture, aquiculture, and ostreiculture, and the transfer of the fishes of one locality to another district. By all civilized and commercial nations, especially the Dutch, the English, the Norwegian, the French and the American, the products of the sea have been accounted fully as important as those of the land.

The fishery question is therefore of urgent consequence to the people generally, and any information ought to be welcome which increases our knowledge of the fishing grounds within our reach; for the fisheries are not only of importance to us in consequence of the vast amount of wealth that can be drawn from the deep, apparently without diminishing or exhausting its source, but because, by this means, a body of able and hardy seamen may be found to conduct the commerce of a maritime country during peace, and to become its gallant defenders on the ocean in time of war. I sincerely hope, that both our public men and our capitalists, will give their attention to this very important question and will do their utmost to develop further this inexhaustible source of national wealth and greatness.

IV.

CANADIAN AGRICULTURE.

BY WILLIAM BROWN.

The trite saying that the history of its agriculture is the history of the country, applies much more to Canada, or indeed to any of the British Colonies, than it does to Great Britain itself. The reasons for this are too simple to be specified. The simple fact of the colonization of Canada's being the outcome of the agricultural swarming of other countries will, indeed, convey the whole position.

Thus, then, as our national history is a short one, so our agriculture has but a short history. The men of these days are very much the men who began both, and the British Association for the Advancement of Science is actually shaking hands with the fathers of Canadian agriculture,—with the very men who cut the first tree, who held the first plough, and reaped the first crop of grain on this immense northern continent, which is still, we are proud to say, a part of the British possessions. As we dip into the progressive aspect of our subject, it will be evident that there has been no "new era," no "transition period," nor any great landmark, so to speak, in Canadian agriculture, as there is in that of Great Britain. Ours has been the unchecked march of the invader, bringing destruction to one crop and then a glorious fruitage from others.

It forms a somewhat curious reflection that while we—not our forefathers only, but we—were clearing the forest and stretching

our arms westward, Great Britain not only had no reaping machine nor steam engine, but not even a common scythe, *everywhere*. The mother is here to-day, to see what progress one of her sons has made during the last half century; and, in the manly pride of our independence, we ask you to think what she was herself, when she bade us "God speed!"

Canada is a forest. Nothing ever did strike, and nothing yet strikes, the comprehensive observer so much as the seemingly endless forest, stretching over mountain and valley, and indeed everywhere. This is the first feature of our country to which we invite your attention. Without trees we should probably have had no agricultural history; the removal of them has given us an agricultural history.

I submit most respectfully that the irregular and excessive forest clearing of a newly-acquired country is not only an inevitable sequence of man's unrestrained domination, but a step absolutely necessary to progress and wealth. On another occasion, I shall have to submit to this Association some considerations upon arboriculture, and here all I need say on this point of our forestry is that, even assuming that Canadian pioneers were conversant with whatever light there was half a century ago in regard to the proper proportion of tree surface to arable surface, the struggle to win a home, even under all the propitiousness of soil and climate, was too hard and lengthy to stand flavouring with book knowledge, or any thing that did not produce immediate bread and butter.

But still further. The forest agriculture of our country possesses a significance that some of us do not sufficiently measure. The comparative reliability of a country, largely covered with trees, for the health of all animals and the production of variety of crops is a fact everywhere acknowledged. It would not be difficult to prove this in several parts of the world, and over the great breadth of the Dominion we have no difficulty in finding strong proof both of the extremes, as well as of the exact measure of healthy conditions. Our forest lands have more variety of aspect, greater variety of soil, better drainage and water supply, and a more reliable climate than our prairies, for example, possess. The other well-known advantages of woodlands do not form part of my agricultural subject, yet the Canadian farmer has neces-

sarily had to act the part of a forester to a greater extent than the farmers of older countries.

Canada is a land of fresh-water seas. This, the second great feature of our country, is a prominent fact in agriculture, as it has regulated very much of the settlement, and still regulates much of the climate and traffic, of our best districts. The extent of the lake shores of Canada is simply unknown, and those inside the commercial area far outnumber those of any other country by many thousands of miles.

Canada is a prairie, though practically for agricultural purposes we did not know this ten years ago. These untimbered, level, dried-up seas may yet play a very important part in our agricultural history, both as to grain and live stock, to which I shall afterwards devote some thoughts. But Canada is also a land of mountains. Our east and west extremes are bounded by hilly country averaging respectively 3,000 feet and 8,000 feet above the sea level.

The physical features, with the flora and geology of the Dominion of Canada, other than these very abstract ones, are wonderfully diversified and interesting, and must be dealt with also very concisely. We have swamps, beaver meadows, marshes, and hill grazings in great numbers and extending over large areas. We have thousands of miles of rivers, many navigable to great distances, and stretching in their natural navigation from 1,000 feet above the sea level. We have over a hundred distinct varieties of indigenous trees and shrubs, many of great commercial value, and the flora other than this I dare not touch upon. Even our geology, though neither so varied, nor as yet so well outlined, as in some other countries, has an agricultural significance that has made history enough in particular districts, and, indeed, the geologist has of late years been the forerunner of our extended civilization,—his report being always ahead of settlement.

The distinctive soils of the country in the order of their prominence are:—Loams, vegetable deposits, alluvials, clays, sands, and marls. By reason probably of the wider field there is less mixing of these than in an area such as Great Britain, and our geographical position has given a high proportion of glacial covering. The climate does not vary so materially as might be supposed from the great geographical range embraced. We

seem to have seven climate belts ; the extreme eastern embracing Newfoundland and part of Quebec ; the Gulf area, including Nova Scotia and part of New Brunswick ; the St. Lawrence area, including Quebec ; the lake region, embracing Ontario and Hudson Bay south ; the great inland prairie lands ; the Rocky Mountains and the Pacific range. These, in their summers and winters, are pretty well marked by both their outside and local influences as to rainfall and temperature, and consequently are the great regulators of our detail agriculture in this stretch of 3,500 miles.

Having some acquaintance with the very distinct public objection to either a lengthy or statistical paper on what is expected to be treated in a popular manner, I have no intention of wearying you, but some figures are indispensable. The Dominion of Canada at present cultivates about 22,000,000 acres, an amount just equal to the area under cultivation in Great Britain and Ireland, exclusive of permanent pasture. The improved pasture area of Canada is 7,000,000 acres as against 25,000,000 of the Mother Country. The respective populations being 5,000,000 and 35,000,000, we can easily make comparisons of cultivated land per head. The average size of farms in Canada is a little under 150 acres. The average annual gross value of produce is \$23 per acre all over the Provinces, the extremes being as much as \$43 and \$15. Clear profit may be valued at an average of \$3 per acre, that is after paying for labour, maintenance, interest on capital invested, and other charges. The average farm carries live stock to the value of \$8 per acre, which fact alone points to grain as still in place of beef and mutton. Land when rented fetches \$3.80 per acre per annum. The average purchase price of land throughout the Dominion is about \$35 per acre, the extreme averages being \$40 and \$12. Buildings stand at an average of one-fourth of the value of the land in cultivation and are included in the foregoing figures. The annual taxes upon land consist of a township rate, a school rate, and a county rate, in all amounting on an average to 10c. per acre, or \$15 per the average farm of 150 acres, or, in other words, to the rent of an average $1\frac{1}{2}$ acres in Britain. There are six different kinds of farming usually called: Mixed Farming, Grain Farming, Dairy-farming, Pasturing, Live Stock Breeding, and Fruit Growing.

Land is actually being occupied (not purchased necessarily) at the rate of 383,000 acres, and reclaimed at the rate of 100,000 acres per annum, and wheat production has increased at the rate of 70,000 acres per annum, throwing aside the odd acres.

A new country, therefore, has several well-marked agricultural differences that must be interesting to very many. Production runs away from population at an immense rate: they are not corresponding elements in national progress. Our population has clearly been hitherto, is now indeed, essentially an agricultural one: there are not many large congregations of the non-farming classes anywhere. But the annual value of produce per acre is here considerably less than that from the older well-cultivated lands in Great Britain, and the annual expenditure per acre both in labour and fertilizers is remarkably low in our case, viz., \$15 as against \$40 in Great Britain.

This leads us on to some features of farm science and practice characteristic of Canada,—the first one being the old one of exhaustion of soils by the repeated cropping of one class of crops without help. The practical importance of such a system has I think been misunderstood, and while I have no idea of excusing the practice, I have no intention of allowing any misconception to go unchallenged.

That the growing of wheat after wheat many times in succession is right scientifically and practically, under certain conditions, no one denies. The point is, when to stop. An average of forty bushels or only sixteen bushels per acre is Canada's experience. We did not stop at sixteen bushels, first, because we could easily increase the productive area; secondly, because grain is less expensive to produce; thirdly, because it is a lazy system of farming, and thus most acceptable to the majority; and fourthly, because the product has always been in demand. Cannot we say, then, that we had many good excuses to justify the practice? Next, while theory says, and practice indicates, that such a system of cropping exhausts the soil, science has not always said so. Can we, therefore, severely blame average humanity, toiling hard to make a home, when abundance for the time being was easily realized?

Another feature of our farm practice is the very limited use of special fertilizers even under our improved husbandry, and their

profuse existence in our own country. I am not now speaking of average farming, but of the best. It is a fact in Canadian experience that the full measure of a variety of crops under suitable rotation upon average soil, with the best of farm-yard manure, can be maintained without the use of special fertilizers, and that the extensive application of them does not give corresponding returns. Practice replies, that thorough cultivation and the best of home-made manure are enough. Science says that such practice must return as much as is removed. Permit the theory that our old lands still retain some of their original richness, latent it may be, but still there, which, properly treated, always responds; that our arid climate does not associate with special fertilizers either to stimulate or fertilize as they are known to do in more humid circumstances; and that even the climate itself is actually richer in plant-food elements than Europe, in addition to the important fact of so much grain being fed to cattle six months of the year.

But our agriculture is peculiar in other respects. Practically, we have only two divisions of the year, summer and winter. To Europeans, we have neither spring nor autumn, particularly no spring term. Hence, seed time with us is a time of great pressure, necessitating prompt action, and therefore much temporary work, that are unknown in British experience. Hence, we possess machinery that takes the place of much of the manual labour of other countries, and our horses are more active and enduring. Man himself rises in physical activity and brain power to meet the requirements of the climate. I think no one has yet given Canada the full measure of value she deserves for climate. This must be owing to want of knowledge to assign a cause for the effects; for the effects are very patent. We are nearly all north of latitude 45° , and necessarily have such extremes of temperature as, not only do not propagate or encourage, but even destroy most of the disease germs that are known to luxuriate in more temperate zones. As this is more remarkable among the live stock of the farm than among other animals or man, it may be partly due to the immediately favourable change in cattle and sheep that are yearly imported from Britain. What a fine field this should be to the keen hygienist?

The farming of Canada is also characteristically affected by

her sunshine and showers. Both are better defined than the same things in Great Britain or the United States; we never have the uncertain heat and rainfall of the one, or the terrible cyclones of the other.

And now allow me to add a few notes on the undeveloped agriculture of Canada. The progress of Canadian agriculture was necessarily, in the choice of land, one of taking the best and leaving the worst. This method in a small area would be very marked as regards the difference between the best and poorest soils; but, as it has been spread over a wide continent as yet but thinly populated, the picking and choosing is not at all a prominent thing. It is a fact at the present moment, even in the older districts, that half of the uncultivated land is distinctly equal to the cultivated, and that the bush or forest of the newer townships possesses soil in every respect equal to the older ones. Not only so, but what long ago was considered waste, in the form of swamp and stony ridge, is now, though uncultivated, valued as in part fit to bear crops. It is a very common circumstance to see men leaving their old homes in search of new lands, while at the same time good investments exist in their immediate neighbourhood. This arises from the feeling of want of room, or of restlessness, or of speculation, so common on this continent. The existence, then, of so much good land easily secured is of itself a hindrance to development in the sense of older countries, and yet, of course, it is this very spirit of possession that has made the country.

Canadian agriculture is undeveloped as regards thorough ordinary tillage. While our rich climate allows us to take things easily, it is certain that, were we to devote more time and labour to common cultivation, the increase would amply repay us. Man, however, that is average humanity, is content with living well under the easiest possible conditions. I could give many splendid exceptions nevertheless. Part of our agriculture is also undeveloped in the sense of inappropriate produce. Changes in farm practice are just as legitimate as in other professions, so that if some of us persist in growing grain instead of beef and mutton, when flesh is wanted, there is misapplied farming on the part of the nation.

The hindrances to the development of our agriculture are very

much those of other new countries. The almost unlimited field for speculation on the part of wealthy individuals and companies holding large tracts to the exclusion of common settlement, is one of these; so also is the temptation to engage in more immediately lucrative professions, such as sea-fishing and lumbering. The possession of much money on the part of many, especially of our new settlers, is not a prominent drawback, because our experience as yet is clearly in favour of moderate means bringing out men's greatest activity and worth. The migratory habits of a large proportion of the agricultural population are certainly a hindrance to *better* farming, if not to progressive occupation. The easy sale and transfer of landed property, and the want of much of the feeling for birthplace existing in older countries, go to make up this list.

Yet there are many improvements in progress. Drainage, particularly, is already a feature in our agriculture, with better fences and roads. The establishment of a greater variety of grasses, and their production in the form of permanent pasture is one of the latest lines of improvement. It would be foreign to such a rapid sketch as this to specify crops in detail.

With the exception of wheat, barley, and fruit, Canada is not an exporter of crops; though as produced in the form of beef, she is so. The proportion of crops is as follows:—

Cereals.....	50 per cent.
Hay.....	25 do.
Pasture.....	13 do.
Roots	6 do.
Legumens.....	6 do.

In this I have not made allowance for the very new and special grain growing of our great Northwest.

The general character of the farming of Canada and its specialties are well marked by districts, and through nationalities to some extent. Beginning on the east, we have oats, barley, and potatoes as peculiar to the Maritime Provinces, with a pretty general indifference to improved live stock; farming in Quebec is very distinct nationally, and cannot well be compared with anything else we have, still less with that of any other country; it resembles a large market-gardening system, with live stock admirably suited to French requirements. Farther west, the

Province of Ontario is essentially British in cropping and live stock, but grows more grain and less pasture proportionately, and, as already noted, rears fewer cattle and sheep per acre. Then Manitoba, and what is called the Northwest, are as yet in the preliminary stage of grain production, growing wheat and oats principally; and British Columbia gives a variety of crops in addition to natural pasture.

I think one of the best evidences of better "thinking" among our farmers is the system of rotation in cropping; it is now common, and telling prominently in our increased annual produce. The better winter feeding of live stock is also though quite a recent, yet now a leading feature of our practice. But the live stock interest otherwise is well worth a thought. That Canada, and Ontario in particular, is specially adapted for this purpose is well known. Its variety of physical conditions, the invigorating and purifying character of its winters, and the ability to produce the kinds of crops so essential to animal life at all seasons, have already marked us as the breeding ground for all others connected by land. Consequently the demand upon Ontario for the best pure-bred farm stock has already outrun all bounds. At the same time our neighbours are wise enough to take advantage of our admirable quarantine—the value of which is due not only to stock quarantine, but to a purifying climate,—ere taking home what they purchase from other countries. Canada can produce pure-bred animals at almost half of the cost in Great Britain, because it has cheaper crops and fewer risks of death owing to freedom from diseases, and it can feed and finish beef and mutton at less than half the cost of the same things in stall and on pasture. What Canada can do in the extensive production of cattle and sheep on the pastures called *ranches*, is now in course of experiment. The field is a very large one. If entered upon with all the light of the present day judiciously applied, it cannot fail of becoming a success. The Rocky Mountain plains at the one end, and the hills and valleys of the Maritime Provinces at the other, are waiting development in the extensive and cheap production of beef, mutton and wool.

With the exception of the United States, no country receives so much help from government in its agriculture as Canada does. Not only is this true of the Dominion as a whole, but every

Province has a special Minister of Agriculture, giving special aid to Agricultural Exhibitions, and to special lines of industry such as cheese, butter, fruit, entomological, veterinary, and general agricultural education. I do not anticipate too much, when I say that nearly every Province will soon have its own Agricultural College, as Ontario has at Guelph.

The effect of the United States upon Canadian agriculture is of necessity very clearly manifest. In crops we produce some that they cannot do so well; and of much, they can produce more than we can: thus commercial interchange is not only close geographically, but for mutual progress should be thoroughly reciprocal. They want live stock, we want corn (maize); they have no clear road to the British market, we have no hindrances to it; they require facilities, we want money. But, irrespective of their agricultural products, the much greater population of the United States will always exercise a beneficial influence on whatever Canada has to spare from her own surface.

Thus, then, Canadian agriculture in relation to Europe plays a somewhat similar part, and yet a competitive one both to the United States and Europe. We are at that stage in national enterprise when bone and sinew are good, yet immature; we are like a young man feeling his way in the world. We have maturity and wealth opposing us even at our own doors, and the same things meeting us everywhere else. It is obvious, therefore, that our own future in the world's agricultural market must be cautiously and firmly dealt with. These are no times of half measures and indecision. To peddle beef and flour in Great Britain against her own farmers and all other comers implies more than commercial acumen; it means such a disposition of our landed estate, politically, scientifically, and practically, as shall bear the crucial test of such an association of men as the present British Association.

V.

AGRICULTURE IN THE PROVINCE OF QUEBEC.

BY SYDNEY A. FISHER.

In writing a paper on the agriculture of the Province of Quebec, I think I can better meet the request made to me by giving a general account of its position and prospects, with some of the conditions peculiar to the circumstances here, than by quoting statistics which can be found in the Census and Agricultural Reports. Moreover, as I understand that a French-speaking compatriot is to present a paper on the same subject, probably dealing chiefly with the agriculture of his section of the Province, I shall draw your attention more especially to the farming of the English-speaking Eastern Townships.

This district is the hill country lying on the borders of the New England States, on the south side of the St. Lawrence River, a district measuring about 170 miles in length, from east to west, and varying from thirty to fifty miles in width from the 45th parallel of latitude, which is the boundary between us and the United States. The outlying spurs of the White and Green Mountains here extend into Canada, making this a country of hill and dale, with many streams, rivers and lakes, that afford a varied and beautiful landscape, such as can hardly be found in any other part of the Dominion. Still, it is not so mountainous as to preclude wide meadows and extensive well-tilled fields.

Nature, however, has decreed that agriculture here cannot be carried on in the same wholesale manner as on the great prairies

of the West, and our people are forced to be content with mixed husbandry, raising each particular product on a comparatively small scale. There is, however, compensation for the want of fields, square miles in area, in the fact that our water supply is especially abundant and good, our herbage particularly rich and sweet, and our climate such that we can raise a great variety of crops and fruits; while from our central position between the great ports on the St. Lawrence and those on the Atlantic seaboard of the United States, our market facilities are very good. I must not, however, in speaking thus of the Eastern Townships omit to draw your attention to the different conditions of agriculture on the Island of Montreal and in the flat plain between that hill country and the river. In both of these there is abundant opportunity for large enclosures and extensive raising of grain and hay; and this is the system pursued on the plain alluded to. On the Island and in the Townships, dairying and the production of beef and stock raising are the staples of the farming community, and I trust that, before many years have passed, the intermediate district will follow the example of our neighbours.

The Eastern Townships are still in a great part undeveloped, and from their hilly nature and the comparatively recent clearing from the virgin forest, will probably strike the eye of an European as being very rude in their condition; and I must admit that this is to a certain extent correct.

In writing about our agriculture I find it somewhat difficult to be just and accurate, for in our agricultural community there are two great divisions which it is not easy to describe or define. One class is composed of men who are really farmers; another, of men who are, strictly speaking, pioneers, axemen, lumbermen, labourers, anything rather than farmers, though they own the land, work on it, and obtain the greater portion of their livelihood from it. I need not say that the methods of cultivation and farm management of these classes are very different. Besides this, a good many of our farmers, being the sons of the pioneer class, have been brought up without any instruction from their fathers in careful agriculture, and, finding the stage of pioneer work past on their farms, are often willing to sell out and move into some newer neighbourhood, where they can resume that

pioneer work in which they are adepts. Others again adapt themselves to their new conditions, and we find, generally speaking, that the third generation may fairly be called agriculturists. Among these I am confident that there is to be found as high an average of intelligence, knowledge of their business, energy and thrift as can be discovered anywhere on this continent. It is of these men and their methods that I intend to speak now, as I feel that theirs is the real agriculture of the present and the future of this Province.

From what has been said already it will be understood that dairying stands in the first place in their work, especially the butter dairy, and you have only to look at the market quotations in any Canadian paper to see that there is a special class of Eastern Townships butter which stands next to the highest on the list. This product is constantly improving in quality, and as the trade becomes more thoroughly organized, more justice, I trust, will be done to the producer. The reputation of our butter in the English markets is lowered in consequence of the delay in its transport, generally caused by the speculative holding of the dealers, so that it is at a disadvantage in competition with Irish, Dutch and Danish butter. There is also a great deal of cheese made here, but not so much proportionately as in Ontario and the French-speaking counties of Quebec, as the majority of the farmers prefer the home butter making.

In conjunction with the dairying, a good deal of fattening for beef is done, much young stock is raised, and sheep and horses are largely kept. Most of the two latter classes of stock are sold to the United States market, having a high reputation there. Unfortunately the demand for our coarse wool is very limited, which has discouraged the keeping of sheep, except in small flocks for home use and for mutton. This is doubly unfortunate, as the country is well suited to sheep pasture; but it is a curious though undoubted fact, that sheep will not do well in large flocks. Whether it is in consequence of the necessity of sheltering and feeding them, and the confinement and frequent crowding during the winter, does not seem to be determined; but the fact is so generally acknowledged, that farmers will not keep over fifty head through the winter.

I expressed the hope that before long the farmers of the St.

Lawrence plain would adopt some form of stock keeping, for at present they are short of manure, and, although the wonderful original fertility of their land has so far withstood the many years' cropping, first of wheat, then of barley and flax seed, now of hay and oats,—all of which have been sold off the land, with hardly any manure returned to it,—they must soon alter their method. With their level, easily-tilled and extensive fields which give great facility for grain, root, and hay raising; with the close proximity of a natural stock-raising and pasture land among the hills to their south, and with their easy access to the port of shipment, Montreal, fattening beef for the English market seems their refuge from soil exhaustion and financial ruin. After carefully examining this question with the advantage of close acquaintance with all the circumstances, I am convinced that here, close to a large centre, in a well settled district where all the rough work of the pioneer has long been accomplished,—with all the advantages of established municipal organization, of good schools, churches, stores, good roads and abundant railroad communication in actual existence,—there is an opportunity for the investment of capital with the certainty of just as speedy and just as great returns as can be looked for in any of the much vaunted regions of the great West. The other advantages of being in an old community are more easily pointed out than estimated.

I will now add a few words about two of the supposed disadvantages that we have here to contend with. I allude to the long and severe winters, and the forests which cover our new lands.

Strangers, probably, will be surprised when I say that, even from a farmer's point of view, still more from the point of view of one who wishes to establish himself and his family in a permanent home, these are not disadvantages at all. Englishmen no doubt imagine that when the earth is frozen and covered with snow, no farm work can be done, and also, no doubt, with perhaps a passing glimpse of a stump-covered field hedged in by a forest of tall trees, they shudder at the labour of turning that forest into cultivated farms. There is, however, plenty of work in the short days of winter, partly in consequence of the existence of that very forest; and, although the farmer cannot during winter

till the land, his supposed enemy, Jack Frost, does yeoman service for him in the pulverization and disintegration of the soil, and in the effective prevention of much insect life, which in other warmer climates causes destruction of crops and loss to the farmer. The action of the frost, especially on heavy soils which have been ploughed in the fall, is so great, that in spring they are in a state of fine tilth, such as in England could only be obtained by repeated ploughing and scarifying, while the heavy blanket of snow which covers our fields prevents the frost from penetrating very deeply, so that, helped by the melting of this snow, the frost leaves the soil very rapidly in the spring, effecting an aeration of the land which is very beneficial to the succeeding crop. Again, the snow beaten down into the best of roads enables the farmer to do his teaming work far more easily for himself and his horses.

His forest lot supplies him with wood for fuel and logs to draw to the saw-mill for his building or repairs, the cutting of which he can accomplish more easily in the cold winter weather than in any other portion of the year. Besides the fuel and building material, the forests afford some three weeks' work, in the end of March and beginning of April, in the manufacture of maple sugar, whereby the farmer, at a season of the year when the snow roads are disappearing, and field work has not yet begun, can obtain his sugar supply for the year, and a commodity readily saleable at remunerative prices. These sugar woods are of great value to the community, not only from their supply of a prime necessity of life, but also, because, in consequence of their value as sugar-producers, our maple trees have been preserved. When in other portions of the continent people will be forced to plant forest trees to preserve or renew the necessary conditions of moisture and protection which are so essential to agriculture, our maple groves will relieve us of this necessity.

Thus, notwithstanding our long winters, it will be seen that the farmer, by taking advantage of the different seasons, can be profitably and regularly busy the whole year round with pleasing variety in his work. This gives him an advantage in the hiring of labour, which is one of the most perplexing problems in a new country. As the farmer has work pretty evenly distributed the whole year round, he is able to hire by the year. He thus

obtains superior men, who, from the assurance of steady employment, are better satisfied and take greater interest in their employer's work than when they are only hired for a few weeks or months, at a time when all the farmers are competing for them, to assist in the hurry of wheat harvest or corn cutting, while they are idle or driven into other employments for a large part of the year, as is the case where there is only one special crop.

This distribution of their work over the whole year also assists our farmers in overcoming what I must call the greatest difficulty that they have to contend with. I allude to the scarcity of capital. The desire to own land and to be their own masters which seems to possess our people, induces men, who have but very little money, to buy land, paying down a very small proportion of its price, and undertaking not only to pay taxes and interest, but also instalments of the purchase money, out of the ordinary returns from their land. The fact that many of our prosperous farmers have done this, and at the same time brought up their families, given them a fair education, and a start in life, and are now enjoying comparative ease on farms which have doubled or trebled in value, shows what possibilities there are in our agriculture.

Still it cannot be denied that it is a misfortune for our agricultural system that capital is so lacking and labour so dear, while land is so cheap: for the result is that our farmers are tempted to run hurriedly over a larger area of land, instead of improving the condition of their original fields. If our population would till only one half of the area they now pretend to work, applying the same labour to it, I have no doubt their production would be quite as great, the country would appear to better advantage, and the community would profit in the improved mental and social status of the individual. It is in consequence of this condition of affairs that we have need of, and room for, immigration,—just as much, indeed, as in the newer provinces and territories of the West. We need immigration of men and capital, of labourers (male and female), of farmers who could buy some of this unused, or but half utilized, land and employ labour. These would be able to settle on a homestead where they could at once commence operations somewhat in the manner

they had been accustomed to at home, making allowance for the differences in the climate and conditions of their new country. The new comers would have the advantage of settling among neighbours accustomed to the country, well versed in the methods best suited to its circumstances; while they in turn would benefit the community into which they entered, by their knowledge of the scientific agriculture of the older country from which they came.

Such new comers need not be frightened by exaggerated stories of our climate. Notwithstanding the long winter, the spring advances so rapidly and the soil dries so quickly and thoroughly, that we are able to sow our crops and reap our harvest before the season closes, and we are then enabled to take advantage of the fine fall weather to work at permanent improvements, or on our preparations for next year's crops. The fact that we can raise maize, tomatoes and melons, as well as all the ordinary field crops, shows that our season, though short, must be a favorable one. We also raise the best of apples, plums, and all the small fruits, while in some localities outdoor grapes, pears and cherries are successfully grown. I am glad to be able to say that, of late, our people have devoted much attention to fruit raising and horticulture, and we have found much greater possibilities in this direction than were dreamt of a few years ago. In this connection I gladly give credit to our societies, agricultural and horticultural, which are to be found all over the Province, and which have contributed much to the great advance in our agriculture and horticulture that has taken place in the last few years.

VI.

THE AGRICULTURAL RESOURCES OF NOVA SCOTIA.

BY J. W. LAURIE.

When I was asked to prepare a paper on the agricultural resources of Nova Scotia, I at once raised the question, whether I was limited to facts and results already obtained, or whether I was permitted to refer to possibilities, which might be considered to touch on the realm of opinion or even speculation. I was given to understand that I must confine myself to solid fact; but, the more I looked into the matter, the more certainly it came home to me that to point out the agricultural resources of the Province is, of necessity, to deal with much that is yet undeveloped. Its agricultural history will sufficiently explain how it comes to be very backward, and yet the returns of its yield will show what, even under these disadvantages, it produces. It is but fair then, in dealing with its resources, to consider what it would produce under a favourable system.

The first settlements in the Province were established, rather for military than commercial reasons; hence, with all due respect to my profession, the previous training of the new settlers did not specially qualify them for an agricultural life. Soldiers and sailors have as great a power of adaption as any class of men, but they hardly form the best foundation for an agricultural colony. The U. E. Loyalists, from whom so large a portion of our population is descended, came largely from the professional ranks in the towns of the United States,—men who were quite

unaccustomed to manual labour, or the cultivation of the soil. Then again, the Sutherland and Argyle crofters, who came to us from the Highlands when the landowners abolished small holdings, were a most valuable and law-abiding addition to our population, settling down with all earnestness to carve out for themselves homes from the forest. They were industrious and patient, but, for the most part, without any knowledge of real farming beyond the spade and hoe culture of small patches; and, as their new experiences were chiefly of work amongst the stumps, their training did not lead them into very productive or economical farming ways.

In 1818, when England's enormous war expenditure had ceased, earnest Nova Scotians were led to seek the cause of, and remedy for, the dull times, and Mr. John Young, the father of our late Chief Justice, Sir William Young, published a series of very forcible letters, under the *nom-de-plume* of "Agricola," which called attention to the discreditable state of agriculture. Mr. Young states that, at that time, horse-hoes or cultivators were implements of which even the names had hardly crossed the Atlantic to us; grain-fans were almost unknown, and a common roller was a wonder of which some counties did not possess a single specimen.

Mr. Young gave an impetus to agriculture that has never been forgotten, but the energy and capital of the people have rather been employed in working coal and plaster, lumbering, ship-building, and fishing; the products of which were carried to more developed countries in exchange for the fruits of the soil.

Farming, consequently, did not receive the attention it deserved. Less than half of our people are professional farmers, and many of these combine other occupations with agriculture, which generally suffers in consequence. When the mackerel or shad strike in along the shore, the potatoe-hoe or the scythe is at once abandoned for the oar and the net, and teams that should be ploughing are too often employed in hauling timber from the forest to the shipyards. Our leading men so often boasted of the half million tons of shipping that Nova Scotia owns, that it became an article of faith that all obtainable funds should, in certain districts, go into ships. I can recollect visiting a locality in which I was informed that the recent loss of a ship had forced the sale

of their farms on ten well-to-do men who had been bitten by the prevailing mania, and had mortgaged their farms to build a ship which was lost on the first voyage.

Our iron and coal miners, gypsum quarrymen, shipwrights, fishermen and factory hands, consume the surplus products of our farmers, but our trade returns show that we have, of late years, exported a large amount of agricultural produce. As long ago as 1851 we exported about \$670,000 worth, and our returns for 1883 show an export of over \$1,500,000, and this by no means represents our actual sales over and above provincial consumption. Last summer about 400 steamers called at Sydney, Cape Breton, for coal, and each of them would, of course, lay in a stock of fresh provisions for the crew. We fit out a large fleet of fishermen from our own Province; and our American neighbours, who fish on our coasts, provision themselves in our ports throughout the season. Halifax is also a port of call for a large amount of ocean traffic, and the garrison and squadron, as well as visiting men-of-war, require a large amount of supplies. A constant outflow of cattle and fruit passes from our Western counties to St. John, New Brunswick, across the Bay of Fundy, but, not leaving the Dominion, does not appear in the returns. Cattle, butter, vegetables of all kinds go to Newfoundland and St. Pierre and Miquelon from Cape Breton, while from the Annapolis Valley an enormous quantity of potatoes is shipped to the United States. 100,000 barrels of apples are annually carried over the Windsor and Annapolis Railway, and the manager informs me that he does not carry half the output, as water communication competes very advantageously with his railway; and he calculates, that, when the orchards already set out come into bearing, the quantity will be far more than doubled. Of all agricultural countries, Nova Scotia lies nearest to Europe, and apples and cattle are articles requiring to be put into market with the least possible carriage, and these are essentially products for the raising of which Nova Scotia has great natural advantages.

The weevil was so destructive to our wheat crops between 1860 and 1870 that the cultivation of wheat was almost abandoned, but with greater care and better method, it has been resumed, and, using only round numbers, we have increased from 300,000 bushels in 1851 to nearly 530,000 in 1881. Oats have increased to nearly

2,000,000 bushels; potatoes have increased in the same time from two millions to 7,500,000; turnips, to over 1,000,000 bushels from one third of the quantity; other roots to 326,000 bushels, an increase of over a thousand per cent. since 1851; and these increases show that cattle are better fed,—a sure sign of improved farming. Hay has increased from 300,000 to 600,000 tons; butter, from 3,500,000 to 7,500,000 lbs.; cheese shows nearly 1,000,000 lbs.; apples, of which some were imported in 1851, show in 1881, a product of 900,000 bushels; other fruit increased from 40,000 to 180,000 bushels; hops show nearly 19,000 lbs. in 1881, and could be most profitably cultivated as they grow in profusion, but the cost of labour in picking checks the cultivation; grapes, which do not appear in statistics till 1871, and then as only 8,000 lbs., had increased in 1881 to 35,000 lbs., shewing that our people have found our climate well suited for their growth. 300,000 horned cattle and 400,000 sheep were owned in Nova Scotia in 1881, and 63,000 cattle and 151,000 sheep were sold for consumption in that year.

Of the thirteen million acres of which Nova Scotia consists, a large proportion is lake, of which the shores are generally somewhat stony. The Southern coast is, for the most part, rocky, and unfertile, as if a huge breakwater had been established by nature to the eastward of the continent to breast the Atlantic waves, but this rocky surface does not extend to any great distance inland, and, once passed, the larger part of the land is susceptible of cultivation with good returns.

The census of 1881 shews that nearly two million acres have been improved, of which almost one million are actually under crop,—an increase of more than one hundred per cent. since 1851. But the increase of production has not kept pace with the increase of acreage, and this is partly explained by the wretched methods of farming followed in so many cases, by which lands, when run out for crops, are turned over to pasture, and fresh lands brought in for crops; and of course all would still be rated as improved. The most productive lands,—the so-called dyke-lands, which are the reclaimed salt flats generally formed at the mouths of rivers in the Bay of Fundy by the rise and fall of the tide, and from which the tide has been excluded, many thousand acres of which exist in Nova Scotia,—have not been much increased during this

period; thus, from the lands already cleared for cultivation, an enormous increase of crop should, under proper management, be obtained, and the millions of fertile acres now in forest are also available for reclamation; as the rocky and less fertile soils would still supply the necessary timber for ordinary use and assure the necessary rain-fall.

A question naturally arises, whether the soil and climate of Nova Scotia are as favourable to the production of crops as other competing regions? To this I must bring the testimony of eighteen years' personal experience in farming, on a new farm, and therefore not under the most favourable conditions.

Cattle live out at pasture from June 1st to October 15th, thriving well during that time, and will hold their own for a month longer, if sheltered at night. All kinds of grain grow well. Oats and wheat are usually about a hundred days from seed time to harvest. Last year 25 acres of spring wheat yielded me 25 bushels to the acre. Barley gives about 40 bushels to the acre; oats about 45, but there is a tendency to lodge when the crop is heavy. Potatoes have usually given me about 275 bushels to the acre, and Swedes from 550 to 800 according to the season and exposure of the field,—one facing south or west, giving the smaller crop on account of the heat: a fact that shews that we are near the southern limits of turnips, as they do best in the cooler places.

This has led me to turn my attention to green corn for ensilage, on which I consider that I am only experimenting; but last season I cut (weighing sample carts as I hauled home) twenty tons per acre on a field of fifteen acres. It seems admirably suited to the climate as a plant, the mode of preservation is economical, and the food appears valuable. Hay, the too favourite crop of our farmers, averages $1\frac{1}{2}$ tons* to the acre on upland fields. On 170 acres of cultivated land, in addition to keeping ten horses and about the same number of cows all the year round, I raise sufficient food, with the addition of some purchased oil-cake, which can be paid for by the sale of other surplus crops, to feed for the butcher one hundred head of cattle yearly.

Permanent grass is practically unknown, as, owing to damp in spring and autumn, it becomes overgrown with moss. Our most

*Weight calculated when taken for feed, and not when hauled off from the field.

prosperous farming districts are those near tide water, where the flats already alluded to have been dyked and the flow of the tide barred. These yield two and a half to three tons of hay to the acre, and the after-pasture is magnificent; and as the upland in these districts is usually light, the manure furnished from the dyke-land hay enables repeated crops of potatoes to be raised for sale, so that cattle and crop can both be sent to market.

The upland farmers not unnaturally copy the process followed by these favoured dyke-land owners, and try to work their land as grass farms. But the hay fed on the farm will not maintain the fertility of the hay fields: the grain is weak and poor, a prey to weevil or other enemies; roots, for lack of manure to raise them, are but rarely grown; the farmer and the farm both get poorer instead of richer; and the upland districts, through no fault of their own, get a bad name. A regular rotation is necessary for the maintenance of fertility on this class of farm. This implies stock, implements and plenty of labour, which the average run of farmer is unable to furnish. Men of means who go into farming note the absence of prosperity without examining the cause, and, if buyers of land, buy in the dyke-land districts. Thus capital, the principal want, does not find its way to the upland farms.

Technical training is also urgently required—not merely the knowledge obtained from books, but instruction in theory combined with its adaptation in practice—a want which can only be met by the establishment of an agricultural school associated with a model farm, such as the Provincial Institution at Guelph in Ontario; where working farmers are taught science, educated men to labour with their hands, while the general pupil learns both branches. This, however, to be thoroughly effective and confer the greatest amount of good, must be in the locality and worked under the conditions of climate and products, in and for which the pupils propose to work.

The field for the employment of moderate capital and intelligence is to my mind very favourable in Nova Scotia. A young man who will adapt himself to the new conditions, and has from £500 to £5,000 capital, has every reason to expect a comfortable home and a good return for his investment. With capital invested and knowledge applied, I consider that a very bright future lies before the agriculture of Nova Scotia.

VII.

THE AGRICULTURAL RESOURCES OF ONTARIO.

BY JOHN CARNEGIE.

As it would be necessary, in order to arrive at a just estimate of the agricultural resources of Ontario, to take into consideration the capabilities of a territory covering from one to two hundred thousand square miles, as well as a great variety of products; the writer deems it better to limit his observations to that portion of the Province the resources of which are already moderately well developed, and which may be conveniently described as lying south of a line drawn west from the town of Pembroke to the Georgian Bay, and south and east of Lake Huron.

Although this portion of Ontario contains little more than one third of its admitted and less than one fifth of its claimed area, yet within these limits there is an area one fourth greater than that of Scotland, or of about 25,000,000 acres lying between the 74th and 83rd degrees of west longitude and the 42nd and 46th parallels of north latitude. Besides being the most southerly located portion of the Dominion of Canada, its climate is so favourably affected by its proximity to the large bodies of water contained in the Great Lakes, that the "cold waves," which not unfrequently prove injurious to the crops of the neighbouring and otherwise more favourably located states, are robbed of their virulence before reaching Ontario; and the cultivation of a greater variety of productions is rendered not only possible but more profitable within this area, than within any other area of equal extent upon the American continent.

As the most satisfactory and highest average returns are only obtainable by the agriculturist, where a system of mixed husbandry can be pursued with profit, it must be obvious that the district capable of producing the greatest variety of crops in fairly remunerative quantities in proportion to the labour and capital employed in their production, and at the same time adapted to stock-raising, is richer in agricultural resources, than one in which the farmers' operations are limited to the profitable growth of one, two, or even three cereals—no matter how abundant their yield may be in favourable seasons. In such districts extremes are continually following one another; while in the former, if the cultivator is favoured with no feasts, he is equally free from famines.

That Ontario is particularly favoured in this respect will be best proved by a citation of its products in 1880, as set forth in the Census Returns of 1881. They were as follows:—

FIELD PRODUCTS.

Fall wheat.....	20,193,067 bush.
Spring wheat.....	7,213,024 “
Barley.....	14,279,841 “
Oats.....	40,209,929 “
Peas and beans.....	9,434,872 “
Indian corn.....	8,096,782 “
Rye.....	1,598,871 “
Buck wheat.....	841,649 “

ROOTS.

Potatoes.....	18,893,996 “
Turnips.....	33,856,721 “
Other roots.....	6,479,222 “

MEADOWS.

Clover and timothy hay.....	2,038,659 tons.
Clover and timothy seeds.....	173,219 bush.

FRUITS.

Apples.....	11,038,659 bush.
Grapes.....	3,967,553 lbs.
Other fruits.....	644,707 bush.

MISCELLANEOUS.

Maple sugar.....	4,169,706 lbs.
Tobacco.....	160,251 "
Hops.....	615,967 "
Flax seed.....	38,208 bush.
Flax and hemp.....	1,073,197 lbs.

Then as a natural result, and largely depending upon the successful cultivation of these products, the following animals and animal products were marketed during the twelve months ending April, 1881, viz. :—

Cattle, killed or sold....	363,043
Sheep, killed or sold.....	748,972
Swine, killed, or sold....	796,548
Wool, lbs.....	6,013,216
Honey, lbs.....	1,197,628

besides 116,392 colts and fillies coming forward,—certainly no mean a showing for the 304,630 persons engaged in their production.

As it has been asserted that the district under consideration compares favourably with any other area of equal extent in America, in the variety, quantity, and value of its products, a few figures, taken from the last census returns for this continent, in support of this claim, will not be out of place; especially as so much has been written laudatory of the neighbouring States, and, by implication at least, depreciatory as regards Canada. To illustrate this point clearly, tables have been prepared and are hereto attached, showing the relative position of Ontario as a producer of cereals in comparison with the seven States of the American Union producing the largest quantities of wheat, barley, oats, peas and beans, rye, buck wheat, or Indian corn, and the result is:—

1st. That in order to reduce Ontario to the relative position about to be noted, the resources of no less than twenty-two States, covering an aggregate area of nearly one million square miles, or over 600,000,000 acres, and containing a population of 38,000,000 as compared with Ontario's less than 2,000,000, had to be drawn upon.

2nd. That notwithstanding the unfairness of such a compari-

son, Ontario alone attains even an eighth place in six of the seven cereals named, and that in these she manages to secure a first place as a producer of barley and peas and beans,—her production of the former being largely in excess of that of every State in the Union save California, and her production of the latter nearly equalling that of the entire Union;—a third place for oats and buck wheat; a fifth for rye; a sixth in yield of wheat per acre, and an eighth in quantity, while the larger, more populous, more easily cultivated, and reputable State of Illinois only secures a first in wheat, oats, and corn; a second in rye, and then disappears from the tables altogether.

Although the data at the writer's command do not enable him to pursue these comparisons further from the census records of the two countries, he is, through the kindness of Mr. Blue, of the Ontario Bureau of Industries, enabled to compare Ontario's crop of 1882 with that of perhaps the best agricultural State in the Union, Illinois, for the same year, in the important particulars of yield and value per acre. Comparing the figures given, for Ontario in the annual Report of her Bureau of Industries, and for Illinois in the annual Report of its Department of Agriculture, with one another, we obtain the results given in the tabulated statement upon the opposite page.

Favourable, however, as these figures are to Ontario, they are not so favourable as they would be had the returns of the Department at Washington been taken instead of those of the Illinois Department. For instance, while the yield of fall wheat is given at 18.51 bushels per acre in the foregoing table, the Washington authorities place it at only 16; that of barley at 22.50 instead of the 27 given; oats at 37.4 instead of 40.32, and rye at a decrease of 1.71 bushels per acre,—differences which would increase the cash balances per acre in favour of Ontario; on fall wheat, from \$7.57 to \$9.74; on barley, from 87c. to \$6.62; on oats, from 56c. to \$1.48; and on rye, from 97c. to \$1.91 per acre. Gratifying as these results must be to every loyal-hearted Briton, yet two or three points remain to be noted in order to bring out their full significance as an evidence of the superiority of Ontario's agricultural resources.

Of the 13,000,000 odd acres under the crops named in the table, in Illinois, in 1882, no less than over 7,000,000 acres were under

TABULATED STATEMENT.

[illegible]

Indian corn and over 5,000,000 under fall wheat and oats, leaving only some 600,000 acres for the remaining eight crops. In Ontario, on the other hand, only one crop occupied a little more than one fourth of the acreage under the same crops, while its five chief crops did not aggregate as large a percentage of the whole as the three named did in Illinois. And the result of this dependence on two or three crops has been exactly such as the writer has already predicted. According to the State returns for the ten years ending with 1882, the Illinois farmer had, during these years, four good crops of Indian corn and six bad ones, and six good crops of wheat and four bad ones. Happily for the Illinois farmer, however, the bad crops of both only came together twice, thus proving that the farmer's safety lies, not in "specialties," but in a variety of crops.

In view of the large non-agricultural population contained in Illinois, the small quantities of barley, peas, buck wheat, beans and roots grown can only be accounted for on the assumption that its soil and climate are not favourable to their growth. And this assumption is materially confirmed by the fact that in all these articles the price is either as high or higher in Illinois than in Ontario, while in all the other crops the position is reversed.

In order that the decided advantage, which these statistics prove Ontario to possess as compared with Illinois, may be fully appreciated, it may be stated that the per acre differences first mentioned aggregated, on her crop of 1882, over \$15,000,000, made up as follows:—

On 1,188,520 acres fall wheat, at \$7.57.....	\$8,997,096
" 586,817 " spring wheat, at \$3.70....	2,171,222
" 848,617 " barley, at 87c.....	738,299
" 1,375,415 " oats, at 56c.....	770,232
" 189,031 " rye, at 97c.....	183,360
" 206,924 " corn, at \$5.76.....	1,191,882
" 106,700 " potatoes, at \$6.40.....	1,028,480
Total.....	\$15,080,571

and that, were the Washington figures taken as a basis for this calculation, this sum would be still further increased by \$8,800,000.

In 1880 the number of persons engaged in agricultural pursuits in Ontario was 304,630. Assuming that this number had

increased to 315,000 in 1882, the differences just noted were equivalent, in the first instance, to over \$47, and in the second to over \$75 per head of those so employed.

One more test and the writer has done with this branch of his subject. The last census for the two countries gives the numbers engaged in agricultural pursuits as 304,630 in Ontario, in 1880, and as 436,371 in Illinois, in 1879. For various reasons it will not be unfair to Illinois to assume that the number of persons so employed increased five per cent. in that State during the three years, as against two and a half per cent. during two years in Ontario. This would make the number so employed in 1882, in Illinois 458,189, and in Ontario 312,245. Then, by adding together the value of each of the eleven crops mentioned, at the yield and prices given, in the State and Provincial returns, we find the aggregate value for Ontario to be \$102,598,167, and for Illinois \$163,518,136, equivalent to \$325 per head for those so engaged in Ontario, as compared with \$356 in Illinois. This shows a difference of \$31 per head against Ontario, which the Washington returns would, however, reduce to \$3. But, when it is remembered that even in the best cultivated portions of Ontario, much is still being done in the way of permanent improvement, and more particularly, that many of those engaged in agricultural pursuits in Ontario are chiefly engaged in redeeming the soil from a state of nature, there will be little difficulty, even after giving Illinois the benefit of its own figures, in arriving at the conclusion that the real balance in this, as in so many of the preceding comparisons, is in favour of the agricultural resources of Ontario.

It will have been noticed from a statement of products, given in the earlier part of this paper, that the production of fruits has already made considerable progress. The rapidity with which Ontario's resources are being developed in this direction, will be best illustrated by the following statement of its fruit crops, in 1870 and 1880, as obtained from the Census Returns:—

	1870.	1880.
Apples, bush.....	5,486,504	11,400,517
Grapes, lbs.....	1,028,431	3,697,555
Other fruits, bush.....	292,878	644,707
Wine in dollars.....		\$ 59,200

An increase of from one to two hundred and fifty per cent. in ten years is certainly the best possible evidence that those engaged in its cultivation find it profitable. Nor are reasons wanting to justify us in looking forward to a still larger increase in the future. In 1873 at Boston, and especially in 1876 at Philadelphia, Ontario fruit may be said to have carried all before it, and did much to secure for itself the world-wide reputation to which Canadians believe it entitled. Besides carrying off many of the highest awards, it also drew forth from eminent pomologists such encomiums as: "Decidedly the best show, taking into consideration variety, quality, number, and taste."—"Without question every unprejudiced visitor, competent to form a just estimate, would say that the display of Ontario was the most instructive and comprehensive exhibit of fruits made at the Centennial."—"No State in the Union displayed as full and exhaustive a collection of hardy out-door varieties of grapes."—"Pomological Hall is now a scene of beauty and activity difficult to describe. . . Our neighbours north of the great falls and the great lakes actually led off in this friendly rivalry."—"They are to be congratulated upon the fruit-producing capabilities of their soil and climate." Testimony such as this, like good wine, needs no bush. And Ontario, too, is evidently destined to become a wine-producing country. Although the manufacture of wine is but in its infancy, the day of experiment is past and the only question remaining to be solved is the extent of territory adapted to the growth of the grape for this purpose. In the western section of the Province, the writer is informed, the average product is double that of France, while the quality of the wine made is in no way inferior. Indeed, it is asserted that the climatic conditions are more favourable for the cultivation of the grape on Pelee and the adjacent islands than in any other part of America.

For that most important fruit, the apple, Ontario seems to be particularly adapted. The rapidity with which her export trade in this fruit is increasing, now that she is beginning to get credit for what is her own, and not for what belongs to others, is the best evidence of the perfection and valuable keeping qualities of the *bona fide* Ontario apple; and there can be no doubt that, with the increased care and attention which this

export-demand is sure to beget, it will keep pace with the supply, rapidly as it has increased and is destined to do so.

Among the "other fruits" grown in the open air are included peaches, pears, plums, currants, cherries, strawberries, etc., all of which produce large and regular crops over a more or less extended area, and find a ready and generally profitable market in those sections of the Dominion where they cannot be grown with the same facility.

Although it is not contemplated that this paper should contain more than a brief reference to a few of Ontario's many resources, yet there still remains one department of its farm work, without a reference to which, even this brief and necessarily imperfect paper would be incomplete, and that is the facilities which it affords for stock-raising,—a branch of farm work which lies at the very foundation of a continuous and profitable grain and root production. No matter how rich the virgin soil may be, steady cropping, without any return to the soil of the constituents taken from it, must result in an ever-decreasing yield until a point is reached when it will fail to yield subsistence to the tiller. Under these circumstances the facilities afforded for maintaining the fertility of a district become of quite as much importance as its natural fertility in estimating the value of its agricultural resources. As yet no better or more economical means to this end has been discovered than that of combining stock-raising with the cultivation of the land, as generally practiced in Ontario. For years past, much attention has been given to the introduction of new and improved breeds of all kinds of domestic animals, and to the improvement of existing breeds; and so freely have the best herds and flocks, both in Great Britain and the neighbouring States, been drawn upon for this purpose, that it has become a question whether there are not to-day better animals of their respective kinds in Ontario, than in the herds and flocks from which they sprung. With reasonable protection and care, our climate has proved itself favourable to the development of healthy and vigorous constitutions, and the result is that Canadian-bred animals are being sought after on this very account. As to what can be accomplished in the way of preparing animals for the shambles, we have the records of the great fat-stock shows held annually at Chicago, to prove that

Ontario-bred and fed cattle and sheep can more than hold their own with those of the Prairies and great corn growing States,—another proof, no doubt, that variety in food is as beneficial to the animal as variety of crops is to the farmer. But, although it might be questioned whether the Chicago awards had not been obtained regardless of cost, the rapid progress made in our exports of meat-producing animals proves that the business is a profitable one. An increase of exportations, from 6,940, cattle and 9,504 sheep in 1877 to 55,625 cattle and 114,352 sheep in 1883, leaves no doubt as to which side the balance is on. Moreover, during the same period the production of butter and cheese has also increased enormously.

But, satisfactory as Ontario's past progress has been, and as her present position is, the natural resources of even that portion of it under consideration are still far from being fully developed. Of its 25,000,000 acres less than 11,000,000 are returned as "cleared," while much of that so returned has made only the first step towards its redemption from a state of nature. Even the County of York, in which the capital of the Province and the second city of the Dominion is situated, returns twenty per cent. as uncleared; while other counties, scarcely less favourably situated, return from thirty to forty and even fifty per cent. as untouched by the hand of man for purposes either of cultivation or of pasturage. Looking to this vast field of still undeveloped resources; looking to the unsurpassed facilities which the Province in many places affords for manufacturing enterprises—so valuable as a fosterer of agriculture—and remembering her position with regard to the rest of the Dominion and what has already been accomplished, the writer feels that, flattering as are the following words from the pen of the Hon. David A. Wells of the neighbouring States, they are by no means too flattering to the resources and capabilities of his native Province. Mr. Wells says, with regard to the very district whose resources have been so imperfectly brought under notice: "North of Lakes Erie and Ontario and the River St. Lawrence, east of Lake Huron, south of the 45th parallel, and included mainly within the present Dominion Province of Ontario, there is as fair a country as exists on the North American continent, nearly as large in area as New York, Pennsylvania and Ohio combined, and equal,

if not superior as a whole to those States in its agricultural capacity. It is the natural habitat on this continent of the combing-wool sheep, without a full, cheap and reliable supply of the wool of which species the great worsted manufacturing industries of the country cannot prosper, or, we should rather say, exist. It is the land where grows the finest barley, which the brewing interests of the United States must have, if it ever expects to rival Great Britain in its present annual export of over eleven millions of dollars' worth of malt products. It raises and grazes the finest of cattle, with qualities especially desirable to make good the deterioration of stock in other sections; and its climatic conditions, created by an almost encirclement of the great lakes, especially fit it to grow *wheat*. Such a country is one of the greatest gifts of Providence to the human race; better than bonanzas of silver, or rivers whose sands contain gold."

The following tables give the relative position of Ontario as a producer of cereals, compared with the seven largest producing States in any one of those named. The names are arranged in the order of their gross production:—

WHEAT.

State.	No. of bush. produced.	Yield per Acre.	Order per Acre.
1. Illinois.....	51,110,502	15.88 bush.	4th.
2. Indiana.....	47,284,853	18.05 "	2nd.
3. Ohio.....	46,014,869	18.00 "	3rd.
4. Michigan.....	35,532,543	19.49 "	1st.
5. Minnesota.....	34,601,030	11.36 "	7th.
6. Iowa.....	31,154,205	10.22 "	8th.
7. California.....	29,017,707	15.84 "	5th.
8. Ontario.....	27,406,091	14.06 "	6th.

BARLEY.

State.	No. of bush. produced.
1. Ontario.....	14,279,841
2. California.....	12,579,561
3. New York.....	7,792,062
4. Wisconsin.....	5,043,118
5. Iowa.....	4,022,588
6. Minnesota.....	2,972,965
7. Nebraska.....	1,744,686
8. Ohio.....	1,707,129

OATS.

State.	No. of bush. produced.
1. Illinois	63,189,200
2. Iowa	50,610,591
3. Ontario	40,209,929
4. New York	37,575,506
5. Pennsylvania	33,841,439
6. Wisconsin	32,905,320
7. Ohio	28,664,505
8. Minnesota	23,382,158

PEAS AND BEANS.

1. Ontario	9,434,873
2. New York	1,569,541
3. N. Carolina	957,936
4. Georgia	884,778
5. Michigan	769,539
6. S. Carolina	738,834
7. Mississippi	686,141
8. Tennessee	667,960

RYE.

1. Pennsylvania	3,683,621
2. Illinois	3,121,785
3. New York	2,634,690
4. Wisconsin	2,298,513
5. Ontario	1,598,871
6. Iowa	1,518,605
7. New Jersey	949,064
8. Kentucky	668,050

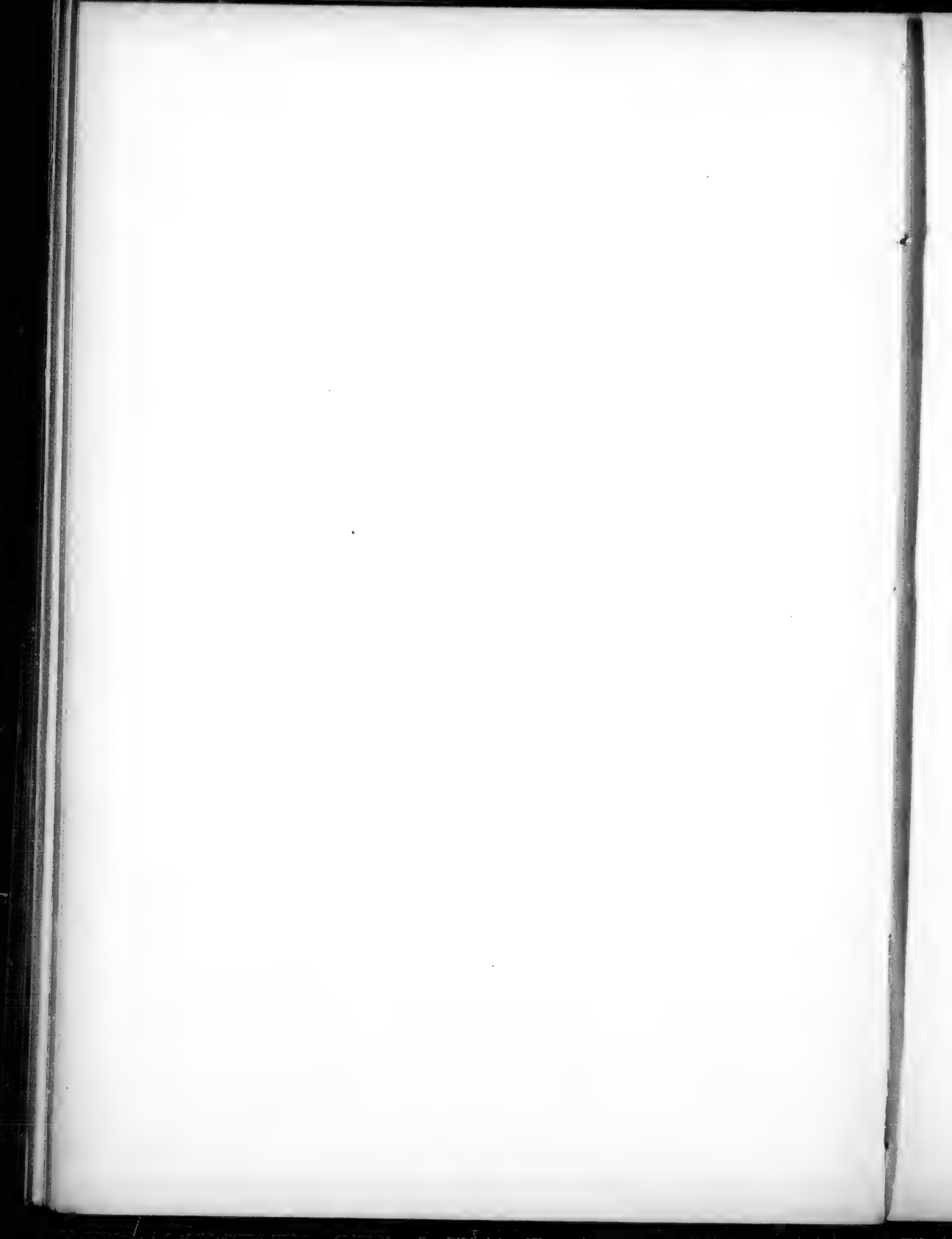
BUCK WHEAT.

1. New York	4,461,200
2. Pennsylvania	3,593,326
3. Ontario	841,649
4. New Jersey	466,414
5. Michigan	413,062
6. Maine	382,707
7. Vermont	356,618
8. Wisconsin	299,107

INDIAN CORN.

State.	No. of bush. produced.
1. Illinois	325,792,481
2. Iowa	275,024,247
3. Missouri	202,485,723
4. Indiana	115,482,300
5. Ohio	111,877,124
6. Kansas.....	105,729,325
7. Kentucky	72,852,263
8. Nebraska.....	65,450,135

Even as regards Indian Corn, Ontario comes in as the 27th, with 3,096,782 bushels.



VIII.

BRITISH AND CANADIAN AGRICULTURE.

BY J. P. SHELDON.

A competition is going on between the farmers of the old country and those of the new, naturally involving fiscal problems which affect already, and in the future will much more affect, the condition of agriculture in both countries. Of the modern and more striking features of this rivalry our fathers had no conception whatever, nor had we a decade and a half ago; but with the older features we had been familiar some time before, though even now we do not apprehend the full scope of the influence that they will exert in the future. That the competition on the part of the new country will become keener, and will extend even further, is clearly enough seen; but we cannot foretell the lines on which it will be developed or the surprises that may be in store. In this age of steam and electricity and multifarious inventions, new and unexpected factors are ever being brought into play; and these involve the adoption of various modifications in farming practices. The twin principles, progress and adaptation, are at work to-day in agriculture as they have not aforetime been, and nothing, even in agriculture, is so inevitable as the unforeseen. Of this a striking instance is seen in the Transatlantic trade in fresh meat, so recently developed, and not less so in that of live animals. I would endeavour to trace out briefly some of the tendencies which are in

play just now, and to indicate the lines which will probably have to be followed in the future.

The exports of dairy produce from the Dominion of Canada, during the years 1873 and 1883, compare as follows. (The Canadian fiscal year ends June 30th.)

	1873.		1883.	
	Quantity, lbs.	Value.	Quantity, lbs.	Value.
Butter.....	15,208,633	\$2,808,979	8,106,447	\$1,705,817
Cheese.....	19,483,211	2,280,412	58,041,387	6,451,870

These figures show a large falling off in butter, but a much larger proportionate increase in cheese; and this may be in part accounted for by the superior advantages which cheese affords for transit purposes, as well as by its better keeping properties, as butter is now made and packed in Canada. Canada, indeed, has in recent years proved herself capable of producing cheese of very superior quality and condition, her climate being, so far as the great American continent goes, exceptionally well adapted to the pursuit of dairy husbandry. But the disparity indicated between cheese and butter, as regards transit and preservation, is one for which there is really no necessity; butter can be so made and packed as to travel safely and in good condition to the other side of the world and back again if need be. Canada can produce such butter and win a large portion of this trade to herself.

The value of Canadian exports, consisting of animals and their produce, for the year ending June 30th, 1883, was \$20,284,443; that of other agricultural exports, \$22,818,519. The great bulk of these exports was sent to England, and the demand in that country is developing in Canada the tendency to increase largely the trade in animals and their produce. Canada, indeed, will owe much of her future agricultural prosperity to the export of beef and mutton and dairy products. The Eastern and Maritime Provinces are still in the incipient stages of agricultural transition, and will in time develop into stock-raising and dairying countries, though the process may

be long in evolution. But there can hardly be a doubt that the tendency is a wise one; first, because they are better adapted for stock-raising than for grain-raising, and secondly, because the Northwest Territory is destined to become, at no distant day, the chief granary of Canada, as also perhaps of England.

Canada does not, however, appear in recent years to have maintained the volume of her wheat exports, though it is probable that the opening up of the Northwest by the Canadian Pacific Railway will shortly enable her to increase them greatly, if she thinks it well to do so. So far, however, as the production of wheat is concerned in British colonial possessions, a new competitor, and a most powerful and therefore dangerous one, has recently entered the lists, and Canada may ere long find herself seriously handicapped by India. The exports of wheat from India to England show a very rapid increase in volume, and these exports have risen thus quickly without causing any appreciable rise in the price of wheat in India. It is probable indeed that the price of wheat there will this year touch a lower relative point than it has ever done before, and it must be admitted that the climate and soil of India are eminently suited for the growth of wheat of fair quality. The probability now is that, with the extension of the railway system of our eastern empire, we may expect, as a direct and rapid result of the competition of that vast country—where cheap labour abounds, and where the cost of living is very low to the working classes—a still further reduction in the price of breadstuffs.

This question is one of surpassing importance to the agricultural well-being of the farmers of the Eastern Provinces of the Dominion, and I may therefore draw the attention of Canadian farmers to the urgent expediency of extending their operations in stock-raising and dairy-farming. It will be well, in fact, for them to copy the best practices of the old country as far as may be, viz., crop rotations made subsidiary to stock-raising, stock-fattening, and the production of milk. And in order to this, conservation of manure, thorough tilling of the soil, and the employment of purchased feeding-stuffs and fertilizers will occupy prominent positions in the farmer's programme.

It is competent for me to record, as a result of personal investigation, my opinion that the Eastern and Maritime Pro-

vinces, in many parts of them, are well adapted to the growth of roots and green crops as well as of hay and straw for forage. These crops supply the foundation for successful stock-raising and dairying; and by stock-raising I do not mean cattle only, but all sorts of animals which go to the efficient equipment of mixed farms.

I may here add a few words relative to the position of the farmers of Great Britain, and their prospects for the future. Seven wet years have left British farmers poor, which means that they are badly equipped to meet the competition which they encounter to-day from every side; and seven good years, better than we have any reason to expect, are required to restore them to the full measure of prosperity which they enjoyed ten years ago. The wonder is that their condition is not far worse than we find it to be, for they have suffered not from wet seasons only, not alone from inferior quality of products, but from shorter fields, and from the diminished values which are the result of sharp foreign competition. But the rent-paying farmers of Britain to-day, so far as law is concerned, are placed in a position much more favourable than that of their fathers, for the money which they bury in the soil, in the way of adding to its fertility, cannot now be confiscated, as it formerly could by rapacious landlords. The prospects of British farmers are, however, brightening, and a few good seasons will revive their confidence and replenish their pockets, while a rapidly growing population will maintain the demand for food no matter what the extent of foreign competition may become. Various means are being taken to inculcate improved practices in husbandry, and sound agricultural knowledge is being imparted to the people. It is in dairy-farming, probably, that the greatest need exists for improvement, especially in butter and cheese making, for the need of tuition in these departments seems to be perennial. Dairy schools and other means of dairy tuition have already effected great improvement in Ireland, and similar means are being adopted in England and Scotland.

Canada, too, may wisely employ similar agencies, for she seems destined to develop into a country, great in her exports of butter and cheese, as well as of beef, and mutton, and live stock. She ought, indeed, to supply England with no inconsiderable

quantity of stall cattle for fattening there, and she may do this so long as, by preserving a clean bill of health, and by excluding American stock from transit through her territory, she remains out of the list of countries which England has been compelled to schedule on account of disease. This present immunity from disease among stock is an immense advantage to the farmers of Canada. The needs of the day in England, and probably in Canada too, in order that agriculture may flourish, are improved practice and greater economy, and the adoption of newer and more efficient ideas, along with more of personal supervision on the part of the farmer and his family. The Canadian farmer owns the land he farms, and can do what he likes with it. This is all very well as long as ownership does not bury too large a capital; but in course of time, as the land increases in value, a landlord and tenant system will grow up in Canada, and it will be well that it should, at the outset, be defined on equitable lines.



IX.

THE APPLICATION OF SCIENTIFIC AND PRACTICAL ARBORICULTURE TO CANADA.

BY WILLIAM BROWN.

It would be difficult to find a country that has had an eminent agricultural history, that does not now complain of want of trees. Advanced nations do not discuss the worth or worthlessness of trees in their rural economy; they merely consider how best to secure full value from them in all their bearings. In doing this, much serious consideration is necessary. It would be very unwise for any country to rush into extensive tree-planting without a clear idea of how the work should be begun, carried out, and maintained. It is my purpose in this paper to show briefly what Canada can do in the scientific and practical application of arboriculture; but, before handling the subject as a forester, allow me to submit some general views.

Forestry will not attain to its proper place in Canadian agriculture, with all its scientific and practical value, until one of two things has been accomplished. There must be the conviction on the part of farmers of the necessity of conserving and replanting, and therefore, of their being educated up to these. On the other hand, the Government should have the power to resume parts of the country for conserving and replanting. It will be difficult to attain to both of these. The former would be the slower but eventually the most thorough means, owing to self-interest; the latter would be more immediate and possibly

less efficient practically, though scientifically better applied. Large numbers of various interests are never so well arranged as by a company, and therefore Government will have to become a company of foresters in the many details of the profession.

Much of our indifference to this subject arises from the common idea that the planter cannot himself hope to receive all the benefits from the conservation of the present trees, and particularly from replanting. Returns, for an American, must be smart, strong, and undoubted; the idea of permanency in the distant future does not concern us so much as present needs. In Europe, arboriculture takes a shape that may never be realized here because of large ownership—the possession within one man's power of all the area and class of soil suitable to profitable production on a large scale, so that even one man can employ officers and men in such numbers as to make profits certain. Cultivated Canada, meanwhile, is so subdivided as to preclude all idea of massing woods sufficient to yield results equal to those of Europe; but the day may come, and progress must be made in some other ways in the meantime.

I believe it is the experience of the world, that more difficulty, in various forms, is found in reclothing a district with trees where trees grew before, than in planting a country for the first time. There is not only the practical fact of succession of cropping in its scientific and natural bearings, as realized for example in the products of the field, but the more serious difficulty of the indifference of those who cut the first crop. Most of us think of trees as means of shelter under several forms. We like shelter for buildings, for ourselves, for animals in the field, and for farm crops. These services alone would give a large value to trees in any district, and would justify all the cost and subsequent attendance. Yet we have another aspect of the question that takes an equally strong place in our regard: climate itself is not merely a matter of external causation, but intimately related to local influences, among which trees are pre-eminent. We have no time to show how temperature, rainfall, moisture, and evaporation are directly influenced by a small or large surface of trees, and how, therefore, water depends largely upon them for local distribution. The second aspect of forestry, as a science and practice, would even seem to swallow up the

previous question, and is in itself an inducement to its prosecution on our part. Were neither of these considerations convincing, the third great reason for the cultivation of trees will surely convert even the most American amongst us. It is not a matter of doubt that, under average conditions, arboriculture in any country produces a more profitable crop than even agriculture. This position is not open to question, but clearly marked in all experience where age has given time for proof. The area of trees in Canada is not an unknown thing in the older districts, and it is not true that it is poorly wooded in comparison with other countries. The United States can show twenty-five per cent., and Canada nearly twice the amount, of its cultivated districts still under trees. This is an area probably larger than that of any other continent with the exception of the northern part of Europe, where agriculture is necessarily at a discount, and the forest is practically untouched. The cause of our discontent, then, is not the want of forest per nation, but of its regular distribution to subserve all the needs of the nation.

The existing condition of our forests is the first consideration in this enquiry. Outside of the lumbering interest, which of itself is simply a taking without system, there is no enclosing, preserving, caretaking, or conserving in any sense, with the exception of the right of individual ownership. The average "bush" of North America is a beautiful sight and yet a sad one. The artist must revel in its variety of form and foliage, but the fighting for place, the smothering and rotting for want of light and air, can only be estimated by those who are scientifically and practically foresters. I do not mean that our forests in every case should be managed similarly to those in Europe, because much of our best timber requires very different conditions, but similar principles ought to guide our management.

There are really no figures to give as to the extent of Canadian forest, either as to gross area or special kinds of timber. The small map recently issued by Dr. Bell, of our Geological Survey, gives a good idea of the northern limits of the principal trees, but, of course, it cannot help us in either of the particulars named. As the country, with the exception of prairie, was originally all forest, and as we have cleared about 25,000,000 acres for agricultural purposes, it may be said that the whole country is still

under trees with this exception. What the extent is to a million acres nobody knows, nor do a million acres one way or the other affect our subject.

We have four distinct fields of operation in the future of Canadian forestry: (1) the untimbered prairie lands, (2) the older cleared portions, (3) the recent forest settlements, and (4) the untouched forest. Each of these will require different methods of converting, clearing and replanting, although all will be subject to one grand system of operations. To submit details now would be unnecessary, when the object is to impress principles.

Still another aspect of the question is the requisite proportions of tree surface to that under farm crops. What should it be? This is just one of the things that we do not know and that we are never likely to know, as a point for general practical guidance. When I had the honor of addressing the British Association for the Advancement of Science at Dundee, in 1867, and at Norwich, in 1868, upon the claims of arboriculture as a science, they knew little upon this point in a country possessing greater physical distinctions than Canada. The conditions as affected by climate, altitude, latitude, aspect, soil, sea or lake neighborhood, and vegetation, are so various, that no possible number of observations spread over any length of time could determine exactly the requisite proportion of tree surface for different districts. However, men do come to realize, through science and especially through practice, that a farm or district needs protection in certain places, and thus a country could easily be reclothed to the extent required for such shelter, if not for regulation of climate and for other considerations to which we shall refer presently. The point then of immediate shelter is within everybody's knowledge, and needs no scientific guidance and, I may here say, no spur from Government. But the wider question of climate while a national problem, is still to a great extent a scientific inquiry, and no one can tell its relation to the proportion of trees to farm crops. Of course, if men disregard everything but the direct profits from trees as a crop upon land, another century may actually find some countries going back to the days of too many leaves and too little arable. Viewing trees in all their relations, I am of opinion that, upon an average of conditions in Canada, one fourth of the

surface should be covered by them; and, as this is just one half of what we have at present all over the forest districts, the apparent inconsistency remains of our wanting to conserve and replant when we possess double what is required. This brings out the fact that it is, in our case, the *irregular distribution* of tree surface that gives trouble,—some parts having more than required, while others have been overcleared.

As the subject grows upon our attention, we are concerned next with the question of what parts of the country should be conserved or replanted. In this part of the study it is obvious that our views ought not to be confined to single farms or even to special sections. Referring as we must to the great overruling influences, as previously indicated, we have to deal with geographical features that may embrace thousands of acres that have to be subserved with one or more massing of trees. The exact question, where and to what extent to conserve or replant, so as to avail ourselves of all the virtues that trees are known to possess, is the great problem of the future. To say that we should only replant our less valuable soils is nonsense, though apparently reasonable enough from an agricultural standpoint; that high lands should be conserved or reseeded as against lower parts is largely true, though not generally applicable; and that conserving and replanting must go hand in hand, and take place anywhere as found best through experience, is correct in every sense.

Turning from this view of the subject we are naturally led to speak of the suitability of certain kinds of trees for special purposes. We have soils and climates capable of producing almost anything in tree life, from the pine of the far north luxuriating in an apparently bare rock-cleft, to the walnut of the south that must send its caroty root several feet into a rich soil. The preparation of the soil; the methods of planting, including fencing and draining; the knowledge of enemies and friends in nature; and all the management requisite throughout, in order to attain the highest results, we must pass over on the present occasion.

In order to win success anywhere, we must put in operation such a combination of the scientific and practical knowledge at present existing, as is likely to bring about the fullest realization of tree value. That system is universal in its application, how-

ever small or large the scale, however varied the conditions. Whether we pull down or rebuild, or make entirely new, the system will apply; and, as it is by entirely new work that any system is best exhibited, I will ask you to go with me to the Prairie. The land before us is almost entirely treeless, with an undulating, but generally uniform level surface, an occasional ridge, a lake, a river, cutting deep through the unshaded land, and bounded on the northwest by high lands, such as I have outlined on the map. Here men need never hope to gather wealth from agriculture in all its branches without the help of trees. I can see no great future for Manitoba and the Northwest, unless extensive systematic forestry precedes agriculture. The sooner our Government realizes this, the better for the country. No methods of farming, no railway or water communication, no minerals, natural grazing, or any other advantages will ever "make" a country without trees. I am not theorizing. *A peopled agricultural country without trees is an impossibility.*

In our treeless region, therefore, experience has made us acquainted with a variety of wants that can be subserved by trees, and science points to more. Together, then, they make up a bill that may be thus summarized:—

1. Roadside shade.
2. Shelter for dwellings.
3. Shelter for cultivated farm crops.
4. Shelter for open natural grazings.
5. Shelter for enclosed grazings.
6. Head-water conservation.
7. Wind-breaks.
8. Climatic amelioration.

Any one of these would of course serve more purposes than that implied by its name, but a full illustration of the system requires a form for each.

The accompanying map professes to show all these: from the single shade-tree up to the great climatic plantation, the area or district embraced and the size of each of the classes would be subject to requirements of from one acre to as much as 1,000 acres each. The system or principle is not affected by size; but position and form, or outline, are the prime factors. Size should be

regulated by the particular physical features of the district and the object in view; form, by prevailing winds as well as by the particular object desired, and partly by physical features.

In our prairie example on the map we have a farm of 160 acres made up as follows:—

Timber	30	acres.
Cultivated	125	"
Orchard, garden, buildings, road	5	"
Total.....	160	"

The fields and roads lie north-west and south-east, and therefore also north-east and south-east. By preference the buildings are situated on the southern angle of the farm at a junction of a concession and a side road. In the first place, the roads are lined with shade-trees, which serve as shade to animals in some of the fields as well. Next, the dwelling house and orchard, while open to the south-east, south, and south-west, are shaded by ornamental standards and lined on the north and north-west by trees. This tree line may be called the second sub-wind break of the farm. The barns, with two small fields or paddocks, are also open to the south and protected from the colder winds by a narrow belt of timber in positions similar to the others. The six other fields are, in the first instance, sheltered by a broad belt all round, from the east *via* north to the west, capable of breaking and mellowing the whole farm for cropping. But for live stock under such circumstances, and with twenty-acre fields, it is necessary to provide other shade and shelter. I can speak on this from the actual experience I have had both in Scotland and in Canada. I know of no better form and position for a shade and shelter clump of trees than that illustrated in Fig. C, the position of which is also shown in our farm example. It serves two fields, and from whatever direction the wind or the sunshine comes, the animals can find a retreat in either field. You cannot draw a straight line across this clump without finding a safe corner.

Then, in the adaptation of one form of shelter to four fields, Fig. E is neat and serviceable and, when supplied with water in the centre, is a very valuable acquisition to pastures. In the case of extensive open grazings, the circular belt (*Fig. D*) is also best for various reasons. It resists and breaks storms of wind better

than other outlines; it is less liable to damage by cattle or wind, is more compact, and affords more outside shelter. There should be two passages not far apart and facing south as much as possible; one passage is not enough with a large number of cattle going and coming, and provision is necessary for a stack of hay in the centre.

These are what may be called the purely agricultural divisions of arboriculture. They are definite and practical enough, and little difference of opinion is likely to arise about them. In what remains of my subject there may be difference of opinion in regard to details, and considerable difficulty in proving that anything more is needed than what has already been sketched. It will be said: As each farm has its proper amount of shade, shelter and fuel supply, and even wood revenue besides, what more does the country require?

I have not seen it stated in any work on rural economy that it is as much a national duty to provide for arboriculture as for the proper observance of the laws of health. Yet, while every one acknowledges that without the proper measure of trees there cannot exist the proper health, political economy, science, agriculture and society as a whole, are equally interested in this question; and, since I have already indicated its national aspect, it is only necessary to point out how more than the immediate farmer's work is required.

Over a great plain, such as our Prairie, where storms rage unchecked, where rains come down and go irregularly and uneconomized in any form, and where sunshine is unmellowed, it is necessary to establish agents for the purpose of subserving these and other climatic purposes. Assuming all the country to be planted to the extent already shown for immediate farm use, there exists nothing in particular spots—no plantation exactly placed to conserve head-water streams, no great and small wind-breaks, and no great climatic plantations.

On the map these are shown in position, proper outline, and extent. *Position* is regulated by elevation and the neighborhood of other physical conditions, such as water surface and high land; *outline* is regulated by the direction of prevailing winds, conformation of surface, and partly by public roads; while the *extent* is directed by the indefinitely known influence that a cer-

tain body of trees possesses over climate,—climate being understood as distribution of rainfall, evaporation, natural drainage and temperature. I am aware that we cannot reason on this from any clear or precise experience, and are driven to draw conclusions from actual facts, and there seems to be no doubt that it requires certain massing and kinds of trees to ameliorate climate,—narrow strips and clumps being insufficient, or incapable of doing so.

Head-water plantations, as implied in the name, must surround, or be in the immediate neighborhood of, sources of streams, and have an outline to nurse them, with area consistent with the importance of the source. The circular form is good and applicable to the two springs at *G*, or it may be oval as illustrated at the mouth of the valley, and would also take the position and area of that at the small lake.

Great wind-breaks, being meant to fend the smaller plantations as well as particular districts, have to be carefully outlined, of very considerable extent, and must command an exact position. In the example *H* on the ridge, which is designed to break the storms from the adjoining ranch, several points are noticeable: the land occupied by the plantation is within one block, or range of roads, and therefore does not encroach; it occupies also part of a ridge that is less valuable generally for agricultural purposes; it is formed to cut or feather the storms that prevail in the district—south-west by west,—a point in forestry of very great importance indeed; it is massive or in sufficient body to resist and break the force of the storms. It may be remarked that it would be better to extend the plantation eastward upon the point of the ridge. This, however, I have avoided in order to make the example more difficult.

The other great wind-break is of a different form, while serving a similar purpose. It runs parallel with the public roads, makes no awkward corners for the cultivation of adjoining land, faces the prevailing winds with the exception of the south-east end, and will protect a large area of country.

Lesser wind breaks, as at *J*, are placed as determined by the form of the country on the prevailing-wind side, or where a larger break is difficult to establish. The example on the east of the large lake exhibits both. Position here is very important, and it will be observed that outline and area are arranged to

receive the storms across the lake, break them, and yet yield to them. Sub-wind breaks are easily arranged, and can take various forms and sizes to suit conditions, as at *K*.

Another kind of plantation, as already referred to, is that which I call climatic, the objects of which I have explained. The necessity for its position in a country among others is not so easily proved, either scientifically or practically. Area is obviously of more consequence than form, because it requires a great field of leaves to do what leaves are said to do in climatic amelioration. *M* with eight sides, and the other with four, are designed as concentrated masses adapted to Canada, and of course in their case, more than in that of other plantations, the cost of establishment would be less per acre, and would also better meet the item of revenue. *L* is an example of a conjoint wind-break and climatic plantation.

ESTIMATE OF THE FINANCIAL POSITION OF A MIXED PLANTATION OF
100 ACRES IN CANADA.

(*Manitoba and Northwest particularly.*)

REVENUE.

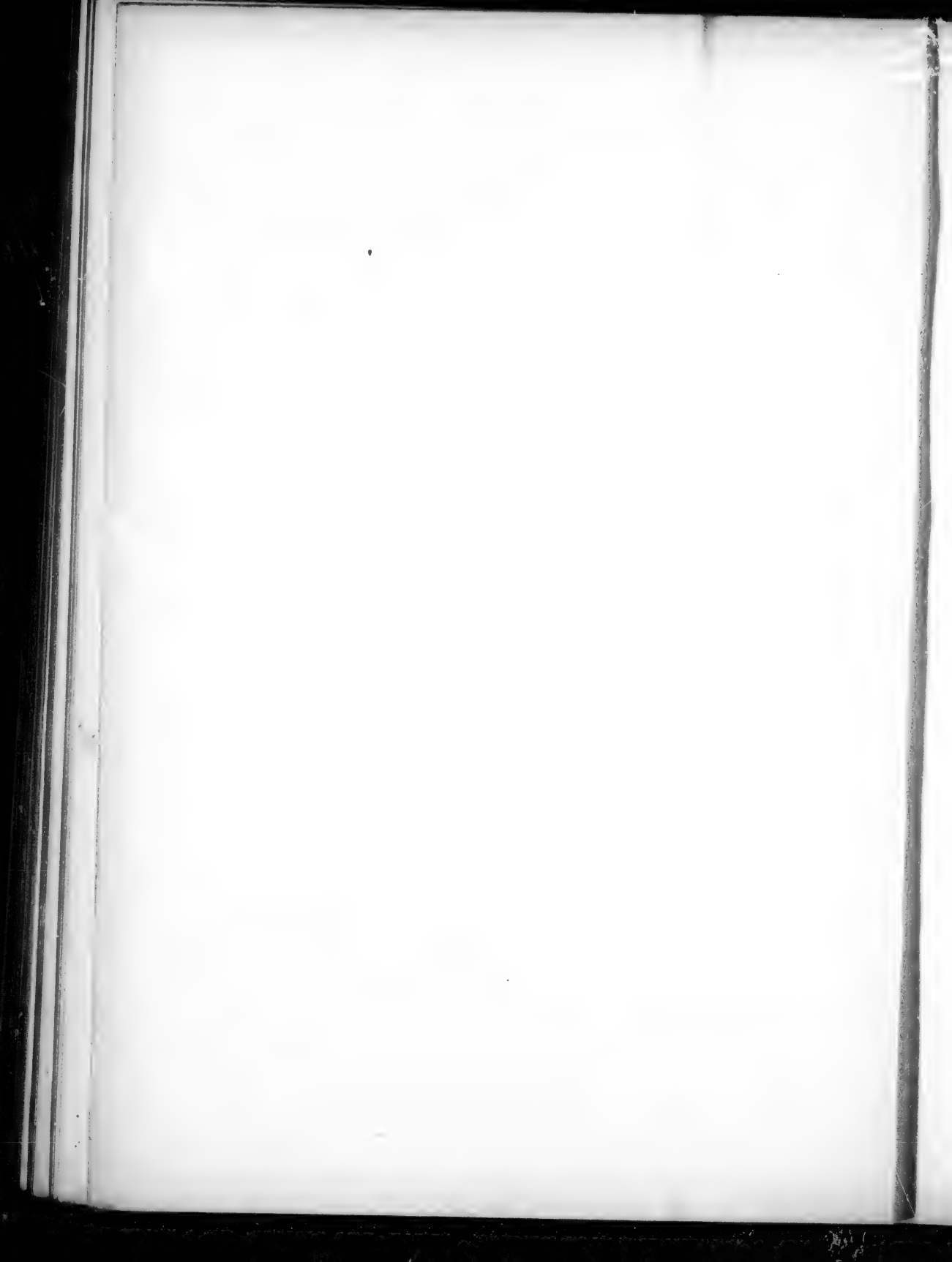
1st. Thinning when 15 years old, 3,000 poles, 20 feet long, at 3c.	\$ 90
2nd. Thinning at 18 years; 8,000 trees, at 5c.	400
3rd. Thinning at 25 years; 15,000 trees, 12 inches diameter at base, 40 feet, at 30c.	4,500
4th. Thinning at 35 years; 25,000 trees, 20 inches diameter; 50 feet, at 50c.	12,500
5th. Thinning at 40 years; 30,000 trees, 22 inches diameter.	22,500
6th. Thinning at 45 years; 21,000 trees, 25 inches diameter, at \$1.00	21,000
7th. Thinning at 50 years; 18,000 trees, at \$1.10	19,000
Gross revenue.	\$80,000

10,000 trees failed, leaving 20,000 trees, or 200 per acre, as permanent crop.

EXPENDITURE.

1,000 rods of fence, at 75 cents	\$ 750
Drainage of portions	250
150,000 trees, 1 year seedling, 1 year transplanted, at 1c.	1,500
Planting same.....	575
Freight on trees	150
Original cost	\$ 3,225
Per acre	\$ 32
Replanting failures for three years, 5,000 trees.....	\$ 100
General attendance, keep-up of fence, &c., for 15 years..	300
Gross cost.....	\$ 3,625
Per acre until revenue begins.....	\$ 36
Cost of thinning and hauling to roads.....	\$ 13,100
General superintendence and incidentals for 35 years ..	3,500
Gross expenditure	\$ 20,225
Balance, being clear revenue....	\$ 60,565
	\$ 80,790

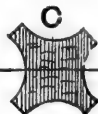
[NOTE.—No allowance is made for interest on outlay and rent of land on the one hand, or for interest on revenue and value of grazing for twenty-five years on the other. Neither is credit given for climatic amelioration, nor for value of permanent crop.]



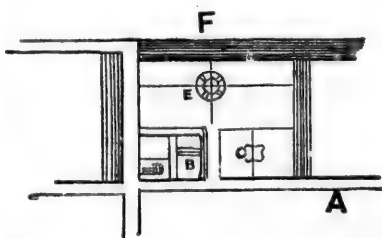
THE APPLICATION
OF
Scientific and Practical Arboriculture
To CANADA.

OBJECTS ;

- 1.—Road-side Shade.
- 2.—Shelter for Dwellings.
- 3.—Shelter for Large Grazings.
- 4.—Shelter for Agricultural Crops.
- 5.—Climatic Amelioration.
- 6.—Revenue from Wood Sales.



P
A
B
C
D
E
F
G
H
J
K
L
M



THE BURLAND LITHO. CO.,

ORICULTURE.

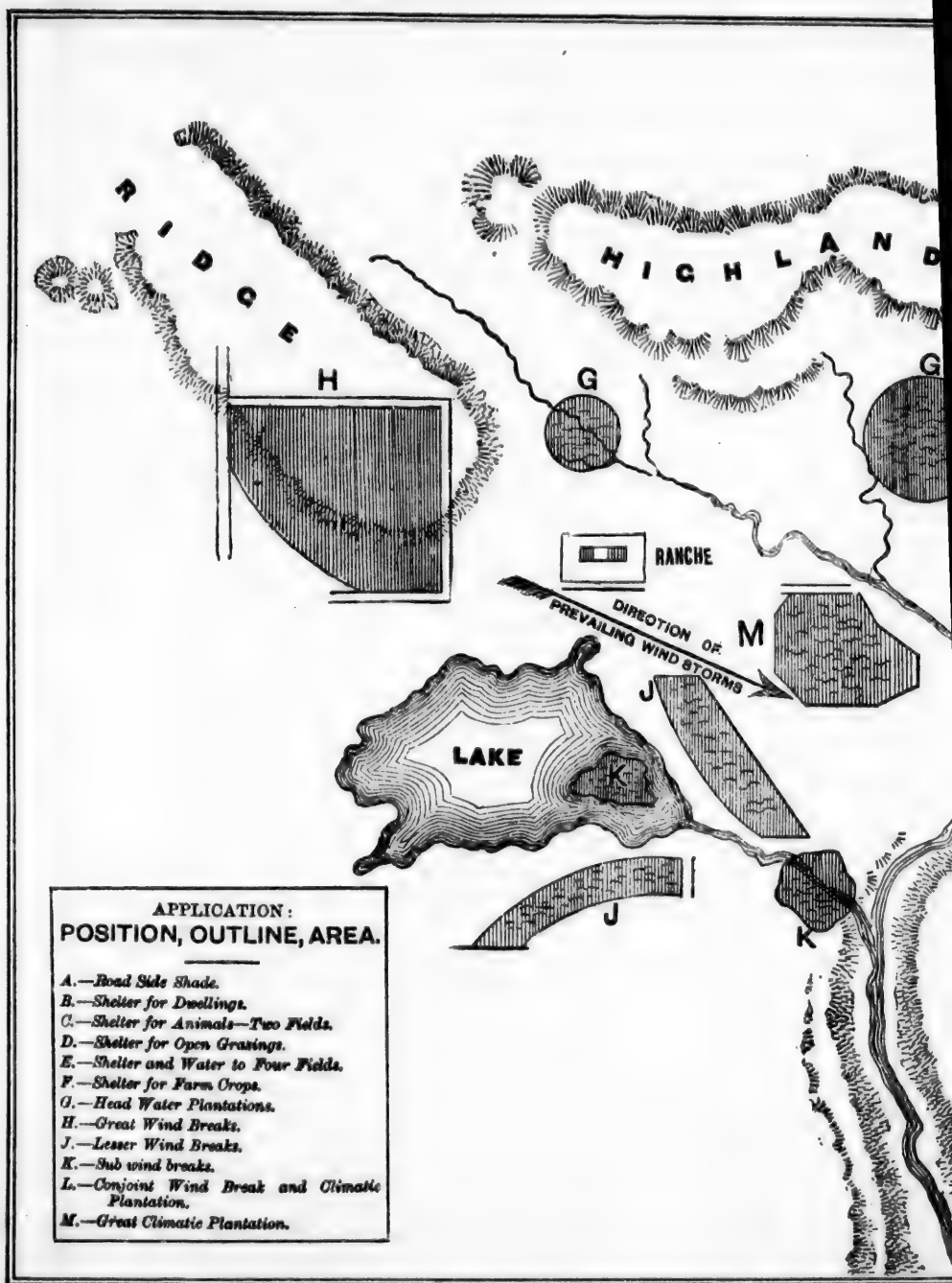
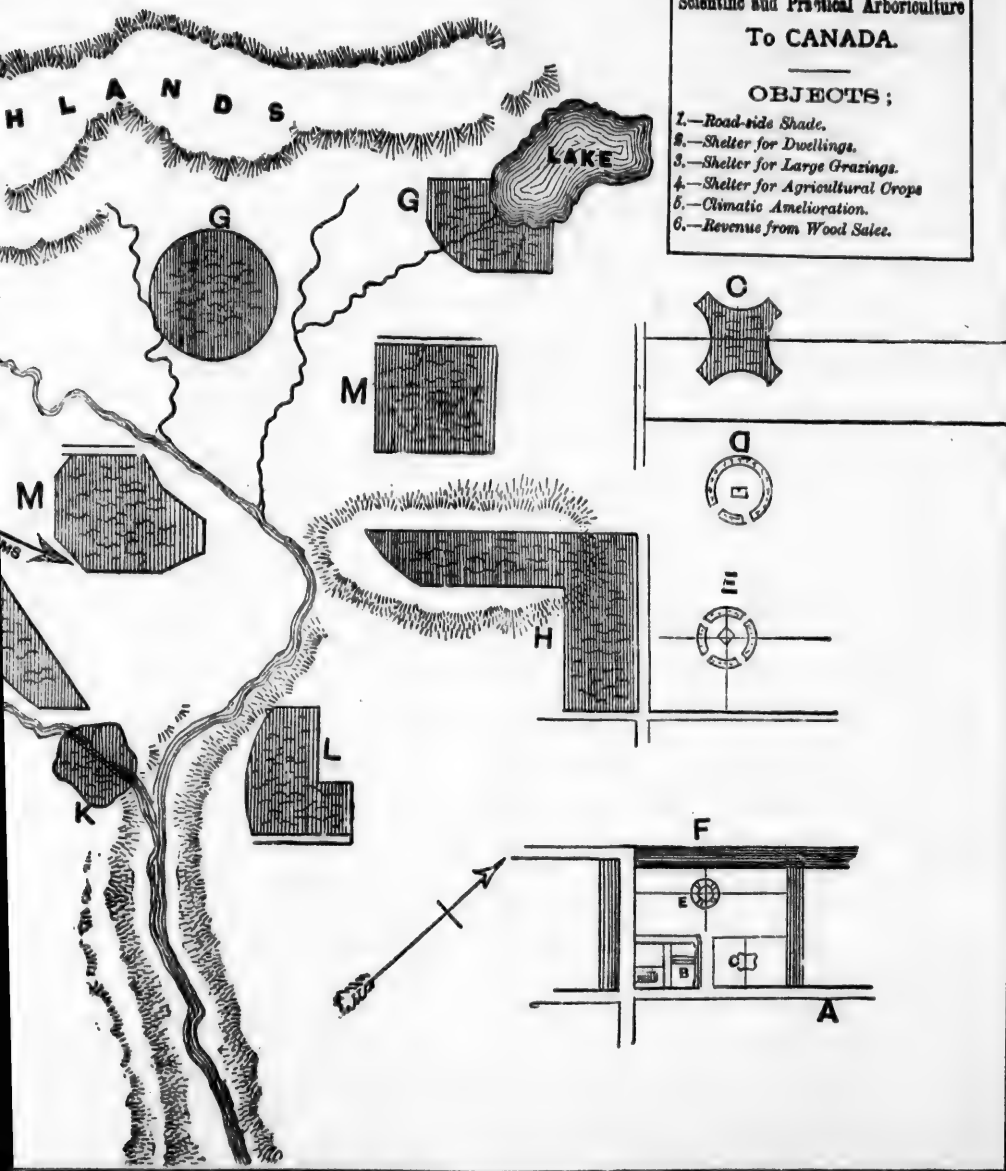


DIAGRAM TO ILLUSTRATE PROF. BROWN'S

THE APPLICATION
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X.

*THE FUTURE POLICY OF FOREST MANAGEMENT
IN THE UNITED STATES.*

BY FRANKLIN B. HOUGH.

Throughout all of the older States of the American Union, and in all of the newer States and Territories, so far as they have been settled, the lands have been conveyed to individual owners, for the most part by allodial titles, and without reservation; except that, as in the case of New York, the sovereign power reserved to itself "one fifth part of all gold and silver ores." These grants were made very generally while the country was timbered, and at a time when the first heavy task of the settler was to clear off a part of the native forest to make room for cultivation.

The woodlands were for many years regarded as of no value, except for the potash that might be made from their ashes, and which generally furnished in part the means for paying the purchase price of the land. The idea that timber was of market value, or that the forests would ever fail to furnish supplies to unlimited extent, and for an indefinite time in the future, does not appear to have entered into the estimate of the value of land; much less did the authorities that granted these lands deem it necessary to make any reservations or stipulations with regard to timber.

It is only since the subject was brought under the attention of Congress by a committee of the American Association for the Advancement of Science, about ten years ago, that it has be-

gun to receive discussion or to awaken inquiry among those in power; and to this day no policy of any kind has been adopted by the central government, with reference to the supply of future wants, except in a defective statute for the granting of certain portions of the prairie lands, upon condition of planting a part with forest trees. Even this law has been made the opportunity for fraudulent practices, that have led to measures for its repeal.

We find ourselves therefore in this condition: the land is all owned by private citizens, by railroad corporations, by state governments, or by institutions (where grants have been made for special objects),—and with no power on the part of either the central or state governments to resume any authority, or to insert any conditions, with regard to planting or cultivation of any kind, except as such control may be acquired by purchase for the public benefit under the right of eminent domain. This right is often exercised in the construction of roads and public works, but the time is distant when it will ever be applied to the resumption of private lands for the planting of forests.

It is true that the central government still owns large tracts of lands in the Territories, upon which valuable forests exist, and a bill is now pending in Congress for the reservation of a large tract of broken mountain land in Montana, as a forest for future supplies. But it is also true that the custom of the frontiers, which has been legalized by acts of Congress, allows timber to be taken freely from the public lands for all local uses, including mining purposes and the construction of railroads. This custom of appropriating public property to private uses has become inveterate: it is practised in a region where the sympathies of the community are in its favor, and therefore no redress can be had by recourse to law under the established rules of jury title.

The project of a great reservation is undoubtedly highly meritorious; but we can easily predict that all the benefits that might be derived from it, even under the most careful system of management, would be absorbed by the country adjacent, and that not a dollar's worth of lumber in any form would ever find its way from Montana to New York.

It is also true that in the State of New York there is a tract of land in broken parcels, which having once been private property, after being stripped of its valuable timber and damaged to a

great extent in many places by forest fires, has been abandoned by the owners as not worth the taxes and has thus reverted to the State. Twelve years ago, these waste lands were but about 40,000 acres in extent, widely scattered, and much of them utterly valueless. A policy of withholding these land from re-sale was then recommended by a Committee, but this advice was not followed until 1883. In the meantime, however, they increased more than twenty times in amount, from failure to pay taxes, and we have now over 800,000 acres belonging to the State.

It is clearly the duty of the State to adopt measures for managing these lands with the view of making them as productive in forest products as possible, and at the least expense. They are worth nothing whatever for agriculture, as has been proved repeatedly for nearly a hundred years by the failure of enterprising men, with an abundance of capital and energy, who have tried and failed to establish settlements upon them. They are not such as one would select for a forest plantation: the circumstances are in many respects adverse, and in some cases, where forest fires have impoverished a naturally sterile soil, the planting or growth of trees is a forlorn hope. This, however, does not justify their neglect, and it is clearly the duty of the State government to do the best it can with the lands as we find them.

It is not my purpose to consider the duty of the central or state governments in the management of their timber lands. The chances are as small of their supplying the wants of the country in the way of timber or lumber, as of the royal parks being able to supply the same material in England. Even under the best management, it would take many years to reduce them to a condition for regular periodical cuttings, and the whole of them together would be but insignificant for the supply of the markets of the country with the twenty-four billions of feet of sawn lumber that we require annually.

Remembering that the end of our resources is already visible, it is time to ask from what source these supplies of timber can be obtained? It cannot be from Canada, because our neighbors there are asking the same question, and their future prospects in matters of forestry are closely analogous to our own. There is no other country in the world to which we can look for timber,

for every civilized country is now drawing upon the United States and Canada, to meet certain wants that cannot be supplied at home. Even Northern Europe, which for a century has been sending its fir and pine timber to other countries, is importing certain kinds of lumber from the United States.

These conditions and future prospects present two problems for our study: (1) How can we economise in the consumption of wood in various forms? (2) How can we obtain the supplies that we require in order to meet the absolute wants of civilized life?

The first of these problems is being solved in a practical way in the progress of our internal improvements, and by discoveries in the arts. Mineral coal is taking the place of wood as a fuel everywhere along our lines of railway, and at the depots for delivery at every station. Our steamboats, our railways, our great manufactories requiring a large amount of steam power, our public buildings, and hundreds of thousands of private dwellings and establishments, now use coal as their principal fuel.

In the construction of bridges for railroads and common highways, iron is coming rapidly into use, where heavy timber structures were formerly required. It is the same in the larger class of ocean steamships, and in the substantial class of large buildings in our cities. The wire fence is rapidly replacing those formerly made of wood, and we are learning the lesson so easily acquired by the prairie farmer, that a great deal of fencing can be saved, by keeping cattle *in*, instead of *out* of their proper range. Tin and slate are more commonly used for roofing than they were formerly, and we may yet learn something of the economy of tiles so well understood in Europe.

These economies are well as far as they go, and might be carried further by the commoner use of stone, brick, and iron in building. But after all, timber and wood are necessary for very many purposes, and, although the arts may find substitutes in some cases, the discoveries of science are every year providing new uses, creating new demands. And this leads us to consider the second question, viz., how we can obtain the supplies that we require in order to meet the absolute needs of civilized life?

As the land mostly belongs to private owners, and as it is evident that no one else will ever plant but themselves, we have

but one way of answering the question: *They must plant their own lands.* As prices advance, the value of growing timber becomes evident. We have known a single curl-maple tree sold for \$1,000, and a black walnut of exceptionally fine grain sold for three times this amount. We have seen \$20 paid for the stump of a black walnut, the body of which had been burned in clearing lands. In many places already, a fine growth of timber will sell without the land for more than the market price of adjacent farming lands. Thirty or forty years suffice to produce many kinds of timber in sufficient size for most uses; and for railroad ties, telegraph poles, and very many other purposes, half this time is sufficient.

There are certain qualities in timber, which time alone can impart; and when the native white pine forests are gone, we cannot expect to see their equal, unless centuries are allowed for maturing the qualities so much esteemed in their lumber. But the hard woods for house building and finishing are fast supplying the place of kinds formerly most used; and, with modern machinery, they can be delivered ready for use at prices very much below those that were usual when hand labour was required.

The forestry question is, with us, divested of many of the vexations that attend it in Europe. We have no Rights of Common to adjust. Our lands are free from servitudes of every kind, save only the taxes that they pay in common with property of every kind. We have no Code of the Chase, save only the Game Laws, enacted for the public good and applying alike to those who own woodlands and those who do not.

Although the planting or the clearing of forests, like the cultivation of agricultural crops, will probably remain as at present, entirely subject to the will of the owners of land; it is easy to foresee that with advancing prices the profits derived from planting, more especially in waste and broken lands, will become more apparent. It is therefore in one sense an educational question. We must unlearn the wasteful habits of the pioneer, and learn all that can be made useful in the way of planting and caring for woodlands, simply as a matter of profit.

While fully believing that very great advantages are derived from the presence of groves and bolts of timber intersperse:

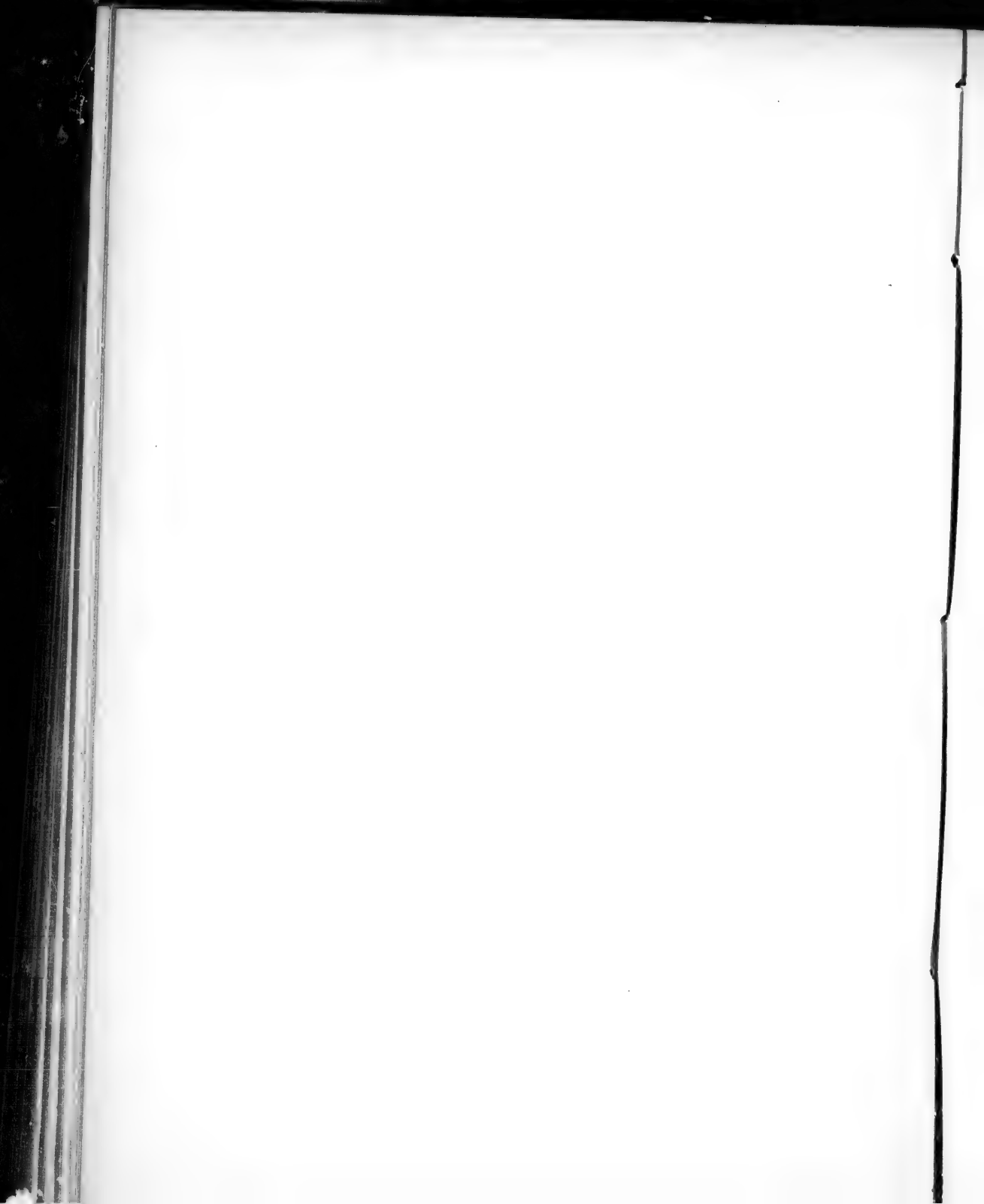
among cultivated fields, owing to their equalizing tendencies upon the local climate, the increase of humidity, and protection from sun and wind, the prevention of floods and drouths, and the maintenance of water supply in streams, springs and wells, we scarcely expect to see planting done by any owner of land on this account. He must see some direct and visible benefit to himself; and as prices advance to a certain point, this will be both seen and felt.

We have spoken of this as an educational question. From the wide difference that exists between our country and Continental Europe, we do not need the Forest Academies that are indispensable there; for at present, and at least for many years to come, the graduate of such an institution could scarcely find employment, unless he had means to own and manage a forest himself.

What we do need is, not so much a high special training in the few, but the more general instruction of the many. There should be, in every College, some opportunity of hearing at least a dozen lectures on the general principles of the subject. Something should be done in our Academies and District Schools, and especially in our Normal Schools, for the training of common-school teachers. In these institutions there should be collections of the various woods and an illustration of their uses. Upon their grounds, there should be living trees in as great a variety and number as circumstances will permit, and the pupils should be made familiar with their names, their peculiarities, and their uses. They should be impressed with the idea that trees and groves should be cherished, and protected, and increased in number; for these pupils will in a few years own all of the land, and these ideas will be of infinite value to themselves and the country, when they have come to be men.

From this point of view, we cannot too highly commend the custom that has come into use in recent years, of appointing and celebrating school Arbor Days. The Superintendent of Schools or the Governor of a State appoints a day, and recommends its being so set apart for the planting and adorning of school-house grounds, and waysides. There are literary exercises associated with the occasion, with recitations, reading of select pieces, music, and whatever else will add interest to the day, and make

it pleasant to remember. In West Virginia, and in Indiana, remarkable results have been obtained by this method. The principal benefit lies, of course, in the impression made upon the young who participate in these ceremonies,—an impression which may be retained by many of them in after-life.



XI.

THE DISTRIBUTION OF CANADIAN FOREST TREES IN ITS RELATIONS TO CLIMATE AND OTHER CAUSES.

BY A. T. DRUMMOND.

I. THE DISTRIBUTION OF TREES.

Excepting the great triangular prairie country east of the Rocky Mountains, lying between the United States boundary line and a line drawn from Red River to the Upper Peace River country, the whole of Canada up to the northern limit of the growth of trees presents one vast forest area, except where it has been cleared by the hand of man. Within this area there are ninety-five species of forest trees which are, however, so distributed as to present interesting peculiarities in range. There are sixty-five species in the Province of Ontario, of which sixty-one are found in the districts surrounding Lake Erie. Of these sixty-five species, fifty-two extend eastward to the Province of Quebec, thirty-five are found in greater or less abundance on the eastern and western sides of Lake Superior, while only fourteen range westward into the prairie country at and beyond Red River,—thus indicating at this point an almost abrupt barrier to westward extension. Again, in British Columbia there are thirty-five species of forest trees of which only seven, the Paper Birch (*Betula papyracea*), Balsam Poplar (*Populus balsamifera*), Aspen (*Populus tremuloides*), Black Spruce (*Abies nigra*), White

Spruce (*Abies alba*), Balsam Fir (*Abies balsamea*) and Red Cedar (*Juniperus Virginiana*) extend eastward beyond the influence of the Rocky Mountains, but these seven with the exception of the Red Cedar, are found somewhat generally throughout the whole Dominion, and, with *Larix Americana* form the vast northern forests which extend almost uninterruptedly over the whole country from James Bay, east to the Labrador Coast and north-west to Mackenzie River.

Taking a general view of the whole Dominion, four great forest areas or zones can be outlined and for convenience may be termed the zones (1) of the Douglas Fir, (2) of Poplars, (3) of Red and White Pine, and (4) of Beech and Maple. Along the shores of Lake Erie is what might almost be regarded as a fifth zone, circumscribed in area but having such characteristic trees as the Buttonwood (*Platanus occidentalis*), Black Walnut (*Juglans nigra*), Sassafras (*Sassafras officinale*), Tulip tree (*Liriodendron tulipifera*), Dogwood (*Cornus florida*), and Chestnut (*Castanea vesca*),—all of them outliers of the forests of the Middle and Western States.

(1.) DOUGLAS FIR.—The zone of the Douglas Fir (*Pseudotsuga Douglasii*) embraces the greater portion of central and southern British Columbia, and includes within its bounds a flora which is distinctive of the country west of the Rocky Mountains. The peculiar climate of the Province, so different from that of the prairie region to the east, and the physical features of the country, both largely tend to foster a flora of a distinctive type. The extensive coast line is indented everywhere with long and wide deep-water inlets and the effect of the low equable temperature of the sea coast is thus spread inland over a largely increased area. The mountains comprising the Coast Range lie very generally parallel to the inlets and thus aid in carrying far inland the moisture-laden sea air, and in affording an abundant rain-fall. For these reasons, the coast flora occupies a greater breadth of country parallel to the coast line than it otherwise would.

Among the most distinctive physical features of British Columbia are the successive ranges of high mountains which run the whole length of the southern half of the Province, and combine in most sections all the characteristics of high peaks, deep river

valleys, and somewhat level plateaus, which serve to distribute the flora somewhat generally over these sections,—the more northern plants finding their way southward on the mountain sides, and the more southern forms ranging northward through the valleys. These mountain ranges occur in almost parallel groups, and, with the principal rivers, lie in a general north-easterly and south-westerly direction, thus favouring the range northward into this region of the trees and other plants of Washington and Oregon. Speaking generally, the interior of the Province in its southern part has in some degree the characters of a plateau shut off by intervening mountains from the moist winds of the coast. This has resulted in a drier climate and in the occurrence of a representation of the plants of Nevada and Utah.

The Coniferae (or Pine Family) include nineteen out of the thirty-five British Columbia forest trees, and in the vast mass of individuals of the species as compared with other trees, form one of the characteristic features of various parts of the Province. In the near future, with the opening up of the country by railways and with the increased utilization of the navigable rivers, the lumber industries of British Columbia will rise to immense importance. Such timber as that obtained from the Douglas Fir (*Pseudotsuga Douglasii*), Yellow Pine (*Pinus ponderosa*) and White Pine (*Pinus monticola*) are already more or less known to commerce, but there are other coniferous trees, such as the Red Cedar (*Thuja gigantea*), Engelmann's Spruce (*Picea Engelmanni*), Menzies Spruce (*Picea Menziesii*), Western Hemlock (*Tsuga Mertensiana*), and Yellow Cypress (*Chamaecyparis Nutkaensis*), whose qualities are not so well known, but which may yet take an important place in the lumber trade of the country. Some of these trees, as the Douglas Fir, occur in great abundance, but often in localities which will be practically inaccessible to the lumberman, until cheap railways are constructed to the rivers or seaboard, and the waterways are improved or utilized. Everyone, however, who has the best interests of the country at heart, must hope that the government of British Columbia will profit by the results of the unwise policy of the Eastern Provinces of the Dominion, and will carefully conserve its forests so as to make them a continued source of revenue, instead of allowing fires and the lumberman's axe to have unrestrained sway among them. In

Ontario and Quebec it is almost too late to grapple effectually with a change of system in the leasing of timber lands, but British Columbia has the opportunity before it.

(2.) POPLARS.—The zone of the Poplars (*Populus tremuloides* and *Populus balsamifera*) may be said to include the whole country east of the Rocky Mountains from southern British Columbia to the mouth of Red River, Lake Nipigon and Anticosti in the Gulf of St. Lawrence, and thence northward to the limit of the growth of trees. The Poplars are found south of these limits, but not in that abundance which makes them here the characteristic species. The southern limits include a very considerable tract of prairie country, but even there, in the river valleys and among the scattered timber bluffs, the Poplar is often almost the only tree. South of the Assiniboine and Qu'Appelle Rivers, Cottonwood (*Populus monilifera*), Green Ash (*Fraxinus viridis*), Elm (*Ulmus Americana*), Maple (*Negundo aceroides*), Oaks and other trees begin to appear more frequently, but the country is almost entirely prairie, and these trees are not in such numbers as to give any character to the vegetation.

In the zone of Poplars, the number of species of forest trees is almost limited to the Aspen (*Populus tremuloides*), Balsam Poplar (*Populus balsamifera*), Paper Birch (*Betula papyracea*), Banksian Pine (*Pinus Banksiana*), White Spruce (*Abies alba*), Black Spruce (*Abies nigra*), Balsam Fir (*Abies balsamea*), and Tamarac (*Larix Americana*). These few species are, however, in such numbers individually as to constitute vast forests as far northward as the extreme limit of the growth of trees. From recent explorations we now know something of the range of these species in what has hitherto been an unknown land—the country surrounding the west coasts of Hudson Bay. The projected opening up of railway communication between Dakota, Minnesota and the Canadian Northwest on the one hand, and Churchill Harbour on Hudson Bay, on the other, has awakened an interest in the resources of this part of the country. At the outlet of Lake Winnipeg into Nelson River, the White Spruce has still sometimes a diameter of three feet, and even in the lower reaches of Nelson River is large enough for building purposes. The Balsam Fir does not here extend northward much beyond Lake Winnipeg and Oxford House on Hayes River. The Paper

Birch ranges as far as the country lying between the Hayes and Nelson Rivers. The Tamarac, in company with the Poplars, nearly reaches the entrance of Churchill River, whilst the Black Spruce is found as far beyond this on Hudson Bay as Seal River. The northern boundary of the forests of the Dominion may, in fact, be defined by an irregular line commencing on the Atlantic Coast, at the Strait of Belleisle, in latitude 52° , and crossing Hudson Bay on the east side at latitude 56° , and on the west at latitude 59° , and stretching thence by way of Mackenzie River, about latitude 67° , to the Alaska boundary. Beyond this line the vegetation consists of scrub and arctic plants. The general north-western direction of the irregular line is very marked.

(3.) WHITE AND RED PINE.—It is less difficult to indicate the northern limits of the zone of the White Pine (*Pinus strobus*) and Red Pine (*Pinus resinosa*) than to say where its southern bounds should be placed. These two trees do not extend westward in Canada beyond the neighbourhood of the Lake of the Woods and the upper stretches of Winnipeg River in longitude 95° . From this general western boundary, the northern limits follow the height of land between the Great Lakes and James Bay eastward to Anticosti and Newfoundland. The southern limits of the zone may, in a general way, be said to stretch in Canada from the southern shores of the Georgian Bay across to the boundary line of New Hampshire, and further to include within them New Brunswick and Nova Scotia. With the exception of the Banksian Pine and the Cottonwood (*Populus monilifera*), all the trees in the zone of the Poplars are more or less associated with the White and Red Pine within these boundaries.

On the other hand, very many trees which obtain in Canada their maximum development in eastern, central and southern Ontario also extend to a greater or less extent into the zone of the Pines, but do not appear anywhere in sufficient numbers and size to form characteristic trees. Both the White and Red Pine themselves range southward throughout Ontario and along the mountainous districts of Vermont, New Hampshire, New York and Pennsylvania, but their best development and greatest numbers in Canada are found in the zone whose limits have been indicated. Although the area of this zone is extensive and the distribution of the Pines throughout it somewhat general, the

districts in which these trees attained their largest size and greatest numbers have already been well cut over; and lumbermen now derive their supplies chiefly from around the Georgian Bay, at the head-waters of Ottawa River and its tributaries, and at the sources of the St. Maurice and other rivers flowing from the north into the St. Lawrence. The timber obtained is also on the average fully one-third less in size than it was fifteen to twenty years ago. The area held still in the hands of the Government and available as Pine lands, is apparently extensive, but only apparently so,—the limits of the greatest development of these trees having been already passed, for as the northern boundaries of growth are approached, not only are the trees fewer in number but they are gradually smaller in size. Besides, immense tracts of these Government lands in northern Ontario and northern Quebec have already been completely denuded of their timber by forest fires.

In the same zone, the White Spruce (*Abies alba*) and Black Spruce (*Abies nigra*) also find their best development, although they range much farther northward and north-westward.

(4.) MAPLE AND BEECH.—This zone covers the country lying between Lakes Ontario, Erie and Huron to the southern shores of the Georgian Bay, and from this point eastward between Ottawa River and the St. Lawrence to the boundaries of New Hampshire. Within this limited area are found sixty-two out of the sixty-five species of forest trees occurring in Canada east of Manitoba. And so generally distributed throughout the limits indicated are nearly all these species that, especially in southwestern Ontario, the greater part of them may be frequently seen on a single farm.

The section of country bordering on Lake Erie lies in the latitude of western New York and southern Michigan, and is semi-insular in character. It is remarkable as including a vegetation much more southern in type than any other part of Canada. Certain forest trees of southern and western range, but peculiar in Canada to this section, have already been referred to. A large number of shrubs and herbaceous plants, more familiar in Ohio, Indiana and the Western States, have also found their way northward into the Lake Erie district. The tree in this section of most economic importance, apart from the Pines and the Spruces,

is the Black Walnut (*Juglans nigra*). At one time it was somewhat common and of good dimensions, but, during late years, a trunk of merchantable size has become somewhat rare. Fifty years ago it was not unusual to find, around London, White Pines varying from 13 ft. to 18 ft. in circumference, and averaging 160 ft. in height, and Oaks of 10 ft. to 15 ft. girth and with 45 ft. to 50 ft. of straight clear stems. This, however, is a thing of the past. Throughout the whole district lying between Niagara River and Lake St. Claire, there is little timber left of size sufficient to attract a lumberman.

II. CAUSES DETERMINING THE RANGE OF TREES.

The causes to which we must ascribe the frequent peculiarities in range of forest trees and other plants in Canada are very varied, but consist chiefly of physical conditions, and changes in climate resulting from these conditions.

The eastern portion of the northern half of the American continent has in its midst immense areas of water, and has widely and deeply indented shores,—Labrador and the great section of country lying between Hudson Bay and the Great Lakes being virtually one vast peninsula. The double effect of a northern latitude and of the presence of these great bodies of water is very marked in the lower general temperature and in the shorter summers and more severe winters. The result of these conditions is to give a much milder climate and a much higher range of trees on the western side of the continent than on the east. Thus Anticosti, whose flora indicates a sub-arctic climate and whose coasts are only used for fishing and lighthouse stations, is in the same latitude as Winnipeg and Vancouver Island, and lies even south of most of the best agricultural land in Manitoba and the Northwest. Again, semi-arctic plants are found on the projecting headlands of Lake Superior, and the combined effects of the broad deep waters of the St. Lawrence estuary and of the cold Labrador current, which sends a branch up this river, are seen in semi-arctic plants even beyond the Saguenay. There is no question that the lower resulting temperature and the short summers have their influence in checking the northern range of many forest trees beyond the outlet of Lake Superior and pre-

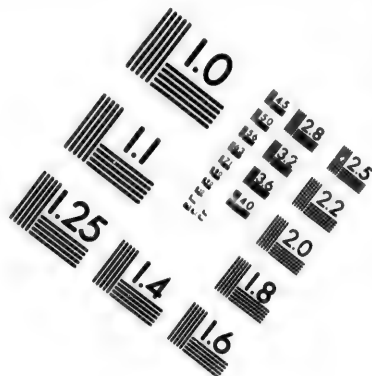
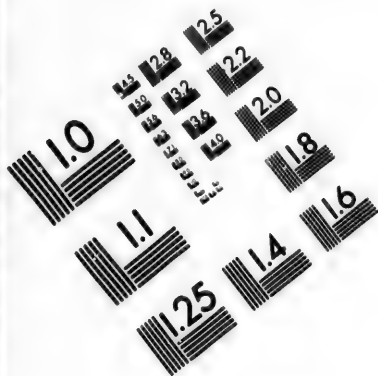
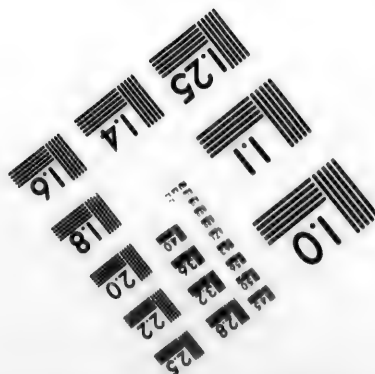
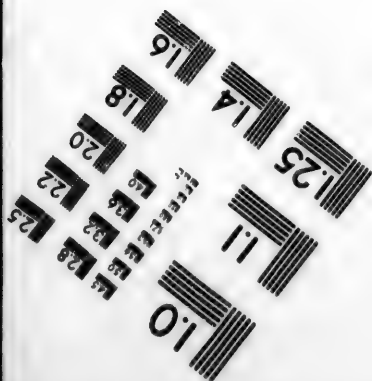
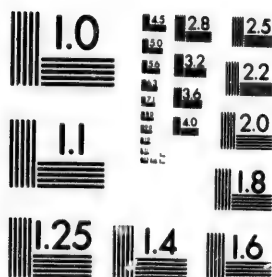


IMAGE EVALUATION TEST TARGET (MT-3)



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venting similarly their extension down the St. Lawrence below Quebec.

In the United States and Canada the mountain ranges are somewhat continuous, and have a general northern and southern trend, and this affords an opportunity to the northern trees to extend southward on the mountain flanks, and to the southern trees to range northward in the valleys. The existence of these mountain ranges has in this way given rise to a more extended distribution than could otherwise occur. Thus the White Pine (*Pinus strobus*), Red Pine (*Pinus resinosa*), Tamarac (*Larix Americana*), Hemlock (*Abies Canadensis*), Paper Birch (*Betula papyracea*), and Aspen (*Populus grandidentata*), among others, extend along the Green Mountains, Adirondacks and Alleghanies as far south as Virginia, and one or two range further. Allusion has already been made to similar features in British Columbia.

An important element in the distribution of forest trees, more particularly in the Ontario peninsula, is the chain of great lakes which forms a barrier to the free northward extension into Canada of southern forms common in Ohio, Indiana, Pennsylvania and western New York, and which should otherwise be expected in the counties of Ontario bordering on Lake Erie. Here we should find such trees as the Cucumber Tree (*Magnolia acuminata*), Red-bud (*Cercis Canadensis*), Coffee Tree (*Gymnocladus Canadensis*), Honey Locust (*Gleditschia triacanthos*), Chestnut Oak (*Quercus Prinus*), Black Oak (*Quercus nigra*), and others whose occurrence at present is doubtful. Whilst, however, the Great Lakes form in this way a barrier, the currents of the lakes have been the means of distributing seeds on the jutting headlands of the northern coasts, and though these headlands have not yet been explored with any special care, not a few southern forms have been observed. At the same time, the effect of such large and deep bodies of water, as the Great Lakes, is to lower the general temperature of the immediately surrounding country, and on the one hand to prevent the range to their shores of numerous plants requiring a higher temperature, on the other to afford a climate suitable for more northern species. Thus, as already mentioned, around the coasts of Lake Superior the flora includes some semi-arctic plants, though inland these all disappear and the vegetation is more of a northern temperate type.

Most trees have some area or country where the climatic and other conditions are most favorable to their development, and where the greatest masses of the individuals of their species are found and their greatest size is attained. As these conditions become less favorable, each tree shows less development. There are thus trees which show a greater growth in the northern part of their range and others which have the reverse. *Arbutus Menziesii* is a tree in British Columbia and a shrub in California. The Banksian Pine (*Pinus Banksiana*) has been found near James Bay of sufficient size to be merchantable, while in the Ottawa valley it is a shrub. *Taxus brevifolia* attains in Oregon to a height of from fifty to sixty feet, and yet in California it rarely exceeds from twenty to thirty feet. On the other hand, there is of course a general tendency in all trees which extend far north to become stunted as they approach their extreme northern limits of growth.

Unlike the herbaceous plants, there are very few trees which can be regarded as rovers—trees suiting themselves readily and naturally to almost every condition, and thus having a wide range. Among those which might be classed as, more or less, rovers are the Aspen (*Populus tremuloides*), Balsam Poplar (*Populus balsamifera*), Paper Birch (*Betula papyracea*), Balsam Fir (*Abies balsamea*) and Black Spruce (*Abies nigra*). They are found from British Columbia to Labrador, and from almost the Arctic Circle to the Southern United States; among the Rocky Mountains, the Laurentian Hills and the Alleghanies, and near the moist coast lines of Nova Scotia and Newfoundland, as well as in, or in the neighbourhood of, the drier climate of the western prairies. Again, in America we have many herbaceous plants which are not only widely distributed there, but are common to Europe. There are, however, only three trees having this feature—the Chestnut (*Castanea vesca*), White Birch (*Betula alba*), and the Yew (*Taxus baccata*), and even these appear to be varieties of the European forms. One reason for this difference between herbaceous plants and trees clearly is that the seeds of trees, on account of their greater size and weight, are less readily distributed. Even those trees, like the Poplars, Birches, Ash, Elms and Maples, whose seeds are of smaller size and have natural attachments to aid in their dissemination, have, for that reason

alone, a wider distribution and are more common everywhere than the Oaks, Walnuts, Butternuts and Hickories, with large heavy nuts whose weight naturally carries them, when ripe, directly under their parent tree.

As already referred to, a remarkable break in the westward extension of quite a number of our Canadian forest trees occurs beyond Lake Superior. The White Pine (*Pinus strobus*), Red Pine (*Pinus resinosa*), Red Oak (*Quercus rubra*), Ironwood (*Ostrya Virginica*), Sugar Maple (*Acer sacharrinum*), Red Maple, (*Acer rubrum*), Beech (*Fagus ferruginea*), Yellow Birch (*Betula lutea*), White Ash (*Fraxinus Americana*), and others range beyond the lake, some of them as far as Lake of the Woods, but, between these two points, lines drawn to represent the extreme limits of distribution of these trees in that section of country would bend southward through Minnesota. The causes which have given rise to this abrupt break may be traced largely to climatic influences. It is just probable that at one time the prairies were covered everywhere, more or less, with forests, and that fires have been gradually widening the area which is now exclusively prairie. The removal of the trees over such a vast space has had its effect in creating a very dry climate, in making it colder in winter than amidst the forest areas, and in subjecting every part of the country to the influence of sweeping winds. These atmospheric conditions, all of which would result from the absence of trees, are probably not favourable to the free growth of most forest trees. Even the trees which do occur—if the cosmopolitan poplars be excepted—prefer the immediate vicinity of the rivers and streams as giving them the moisture unattainable upon the prairie. The effect of this dryness of the climate, of the cool nights and the longer daylight during summer in the Northwest, is seen in the higher grade of wheat produced there, and to the same causes is no doubt to be attributed the alleged superior quality of the wood of the Aspen and Spruce there.

Too much moisture in the atmosphere has equally its results in determining the range of trees. To the frequent fogs which spread over the coasts of New Brunswick and Nova Scotia, and to the moisture-laden air general there at all times, is probably to be largely attributed the absence of the Butternut (*Juglans cinerea*), White Cedar (*Thuja occidentalis*), Red Cedar (*Juniperus*

Virginiana), and White Oak (*Quercus alba*) in the principal portions of these provinces.

The same causes, which prevent the range westward beyond Red River of many of the eastern trees, equally prevail in restricting the eastward range of the British Columbia trees beyond the influence of the Rocky Mountains. Allusion has already been made to the peculiar physical features of that Province, its somewhat generally moist climate and its distinctive forest flora. The barriers to eastward distribution are not merely the great mountain ranges and the climatic effects which they produce, for the Douglas Fir (*Pseudotsuga Douglasii*) and the Western Scrub Pine (*Pinus contorta*), for instance, both cross the Rocky Mountains and are found beyond their flanks on the eastern side. The different atmosphere met with, when the clear open prairie is reached, and the continued exposure there to dry sweeping winds, form further obstacles to the spread to these trees. It does not appear probable that the prairie soil has much to do with the question, as, so far as limited experiments afford any proof, eastern trees at least will readily grow on our prairies when properly cared for and protected from fires and winds. In fact, to make Manitoba and the land westward a successful country for the growth of many fruits, it will only be necessary to create effective wind-breaks around the orchards.

III. THE CREATION OF FORESTS.

The comparative absence of trees upon the prairies has such marked results in the rapidity with which the water is both evaporated and drained from the surface of the whole country, that the creation and preservation of forests, at least around the sources of the larger streams, has become a matter of national concern. These forests would form reservoirs, in which the water would become more frequently accumulated, and more gradually drawn off by rivulets and brooks into the main stream, and thus maintain a more constant and uniform supply. Trees should also be planted not only along the brooks and rivulets, but even along the larger streams. These fringing the banks would limit evaporation, by protecting the streams from drying winds, as well as by shading them in part from the sun. The sources of every

large river should be examined, and, if forests already exist there, an extensive area of them should be reserved from public sale and retained for the nation, as a source of supply for the waters of the river; while where forests do not exist, as at the headwaters of the Qu'Appelle and some tributaries of that and other important streams, an immediate effort should be made to create these by encouraging the planting of trees.

As cities and towns spring up over the whole country, the question of water supply increases in importance. The sites of the future towns will naturally be on the borders of the rivers; but, where these rivers run dry practically during two or three months out of the year, there never can be more than mere hamlets on their banks. While the land in the Northwest is still, in chief part, in the hands of the Crown and the Canadian Pacific Railway Company, the policy of the Department of the Interior and of the railway company can be so moulded as to encourage tree-planting and forest-preservation in the districts specially requiring it: later on, when the land passes into the hands of settlers and speculators, and so many different interests have to be considered and dealt with, it will be very difficult to carry out such a policy. By an amendment made this year to the Dominion Lands Act, the Government is authorized to reserve from sale, lease or license, sections of country at the Rocky Mountains for such purposes as are here indicated. This, if properly carried out on an extensive scale, is so far well, but it is only covering the ground in one section of the country.

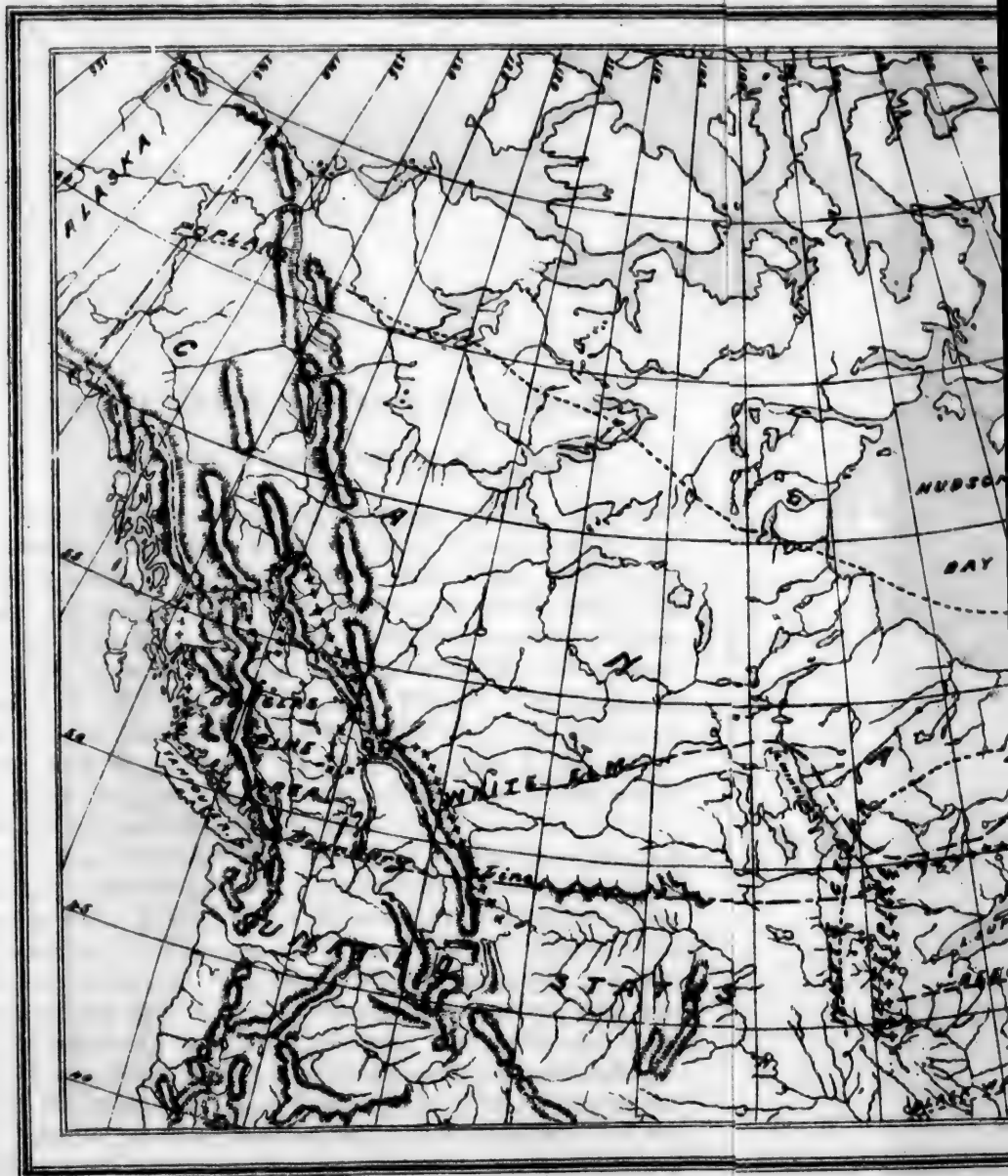
The vast prairie country lying between the Rocky Mountains and Red River on either side of the Canadian Pacific Railway, though possessing such rivers as the Bow, Red Deer, South Saskatchewan, Qu'Appelle and Assiniboine, is, for such an extensive tract, greatly deficient in the small but permanent streams which, in a wooded country like Ontario, are found in every township throughout the province, and are invaluable for agricultural purposes, and which go to make up the volume of water in the larger rivers. In post-tertiary times, the Assiniboine, above Brandon, and the Qu'Appelle, as shown by their widely separated high banks, have been enormous rivers, varying from half a mile to a mile in width, which have gradually cut their way through clays to a depth of 200 to 250 feet below the present prairie level.

Whatever were the original sources from which their supply of water was derived, and which are now cut off, it can be readily believed that, as the country through which the rivers and their tributaries ran became prairie, the volume of water flowing into the rivers would gradually lessen, and that this forms an important reason why they are reduced to their present low level. Were the country wooded instead of prairie, these two rivers would be navigable at all times in summer throughout almost their entire course.

Reverting to tree-planting, it is proper, before closing this paper, to mention that to make it a success, it will be necessary not merely to select trees of hardy species, but to see that the individual trees planted are from parent stock grown in this northern climate. Young trees from, for instance, Ohio or Illinois stock, even of species naturally of a high northern range, will not prove as hardy and successful in every way in Manitoba, as trees of the same species taken from stock grown in Manitoba or in northern Ontario. Such is the gradual effect of climate on generations of a species grown successively in the same place.











XII.

THE ECONOMIC MINERALS OF CANADA.

BY WM. HAMILTON MERRITT.

In this paper I have endeavoured to put together a few facts concerning the occurrence, localities, and past year's output of the economic minerals of Canada. Most of the details with regard to the localities and occurrence of the minerals are taken from the maps of the Geological Survey. The exact amount of minerals raised cannot be obtained, but the total value of minerals exported in 1883 was estimated at \$3,106,830. This amount is obtained from the exports shown in the trade and navigation returns, from which source, and from the Annual Mining Report of Nova Scotia, I have derived the tonnage of each separate ore raised in 1883 and mentioned below.

We unfortunately have not the same reliable statistics and reports of our mines and minerals that are enjoyed by most countries, and which in England are compiled by the Home Office from the Reports of the Inspectors of Mines. The Provinces of Nova Scotia and British Columbia have Mining Departments, and issue Annual Mining Reports, and the former Province especially does much to encourage the mining industry. Throughout the whole of Canada, however, mining may be said to be yet in its infancy; and, in the country at large, comparatively little attention has been paid to mineral development, notwithstanding that the indications and specimens obtained of valuable ore are numerous and widespread, from Newfoundland to British Columbia.

We will view briefly the mineral yield of each Province for the past year :—

Nova Scotia.

Coal	1,422,553 tons.
Gold	15,446 oz.
Gypsum	144,668 tons.
Iron ore	52,410 "
Manganese	150 "

New Brunswick.

Coal	17,670 tons.
Gypsum	15,742 "
Lead	2 "
Manganese	1,066 "
Plumbago	100 cwt.
Antimony	368 tons.

As is shown by the above, coal, gold, gypsum and iron are the principal sources of mineral wealth to the Maritime Provinces. Most of the coal and iron is used in the country, and the gypsum is chiefly shipped to the United States. Some very promising indications of manganese and antimony ores are being opened up.

Quebec.

Copper	4,402 tons.
Silver	78 "
Phosphates (Apatite)	14,268 "
Iron	(not obtainable)
Gold	do.
Asbestos	do.

In Quebec, alluvial gold occurs in quantity along the Chaudière and Du Loup Rivers, and it is worked vigorously in a few places. Copper, antimony, and asbestos are worked in the Eastern Townships; but the most actively prosecuted mining industry in this Province is the extensive development of the apatite beds in the valley of the Ottawa. The Hull iron mine in this region has yielded a large amount of fine magnetic iron ore. Several mines are actively worked for asbestos, the bulk of which product is shipped to the United States and the remainder to England.

Ontario.

Iron	42,745 tons.
Silver	22 "
Salt	197,139 "
Apatite	220 "
Petroleum (crude), about	15,000,000 galls.
Gypsum, about	7,000 tons.

The iron is chiefly worked in the vicinity of Madoc and Kingston, and is shipped to the United States. It is expected that this mining industry will be very largely developed. The salt is worked near Goderich, on Lake Huron, and the gypsum on Grand River. In the vicinity of Petrolia, petroleum has been obtained for many years.

In the Lake Superior region, renewed activity is expected in its numerous mining locations. Silver and copper are worked there to some extent. The Rabbit Mountain mine is yielding some rich horn-silver, and large deposits of iron and zinc are said to have been lately discovered. At Lake of the Woods, mining has been begun on gold-bearing quartz veins which seem very promising, and at the Huronian mine, at Jack Fish Lake, there is reported to be a valuable yield of sylvanite, (a telluride of gold and silver).

In the Northwest Territory lignite coal seams are opening up to a considerable extent.

In the Rocky Mountains alluvial gold has been worked since 1858, and the yield last year was valued at \$631,648. The total amount mined up to the present is some \$60,000,000. Specimens of rich silver, lead, copper and mercury ores are reported to have been found, but little work has yet been done on the Pacific Coast. Anthracite and bituminous coal are operated; 193,485 tons were exported last year, to the United States principally, some 8,000 tons to China, and about the same amount to the Sandwich Islands; 1,890 tons of iron ore were exported to the United States.

THE GEOLOGICAL FORMATIONS in which some of the most important minerals occur, and the districts in which they are found, as shown on our geological maps, are as follows:—

IRON ORE.

Rocky Mountain District.—In three localities in the Paleozoic and two in the Tertiary.

Great Plain.—In one locality in the Tertiary and one in the Cretaceous.

Lake Superior District.—In one locality in the Laurentian, in one at the junction of the Laurentian and Nipigon, in one at the junction of the Huronian and the Nipigon, and one in the Devonian.

Lake Ontario and St. Lawrence District.—In four localities in the Silurian and six in the Laurentian.

Eastern Townships.—In a number of localities in the Silurian.

Newfoundland.—In one locality in the Lower Silurian and one in the Carboniferous.

Maritime Provinces.—In four localities in the Primordial, seven in the Pre-Silurian, six in the Upper Silurian, one at the junction of the Upper Silurian and Carboniferous, one in the Lower Carboniferous, and two in the Devonian. The ores consist of magnetite, hematite, iron-stone, limonite, and specular ore.

The amount mined in 1883 was about 97,000 tons, of which 44,635 tons were exported.

COPPER ORE.

Rocky Mountain District.—In seven localities in the Paleozoic, and one in the Tertiary.

Lake Superior District.—In one locality at the junction of the Laurentian and Huronian, in one locality at the junction of the Laurentian and Nipigon, in nine localities in the Huronian and copper-bearing series, and in one locality in the Nipigon series.

Lake Ontario and St. Lawrence District.—In one locality in the Silurian.

Eastern Townships.—Copper ore occurs in a number of localities in the Silurian.

Maritime Provinces.—In four localities in the Primordial or Lower Carboniferous, in ten localities in the Pre-Silurian, in one locality at the junction of the Primordial and Lower Carboniferous, and in four localities in the Lower Carboniferous.

Newfoundland.—In four localities in the Huronian, in two localities in the Serpentine, and in one locality in the Devonian. The ores are native copper, copper pyrites, and bornite.

Rocky Mountains.—Specimens from a mine opening at Silver City consist of malachite and copper glance.

The total copper mined was about 4,402 tons.

LEAD.

Rocky Mountain District.—In three localities in the Paleozoic.

Lake Superior District.—In several localities in the Nipigon and Huronian.

Lake Ontario and River St. Lawrence.—In four localities in the Silurian.

Maritime Provinces.—In one locality in the Pre-Silurian, one in the Lower Carboniferous, and one at the junction of the Lower Carboniferous and the Pre-Silurian.

Newfoundland.—In one locality in the Laurentian, one in the Huronian, and one in the Lower Silurian.

COAL AND LIGNITE.

Pacific Coast and Rocky Mountains.—Anthracite and bituminous coal are found in several localities in the Cretaceous.

Great Plain.—A number of localities where coal, chiefly lignite, is found in the Cretaceous.

Maritime Provinces.—A number of localities where bituminous coal is found in the Carboniferous.

MANGANESE.

Eastern Townships.—In two localities in the Silurian.

Maritime Provinces.—In six localities in the Lower Carboniferous.

The total amount mined in 1883 was 1,194 tons.

SILVER.

Rocky Mountain District.—In two localities in the Paleozoic.

Lake Superior District.—In one locality in the Huronian and in several localities in the Nipigon series.

The total amount mined in 1883 was 100 tons.

MERCURY.

Rocky Mountain District.—In two localities, respectively in the Paleozoic and the Tertiary.

PLATINUM.

Rocky Mountain District.—In two localities in alluvion.

ANTIMONY.

Eastern Townships.—In two localities in the Silurian.

Maritime Provinces.—In one locality in the Pre-Silurian and one at the junction of the Upper Silurian and Carboniferous.

The total antimony mined in 1883 was 368 tons.

GOLD.

Rocky Mountain District.—In many localities in alluvion and quartz.

Lake Superior District.—In two localities: at the junction of the Laurentian and Huronian, and at the junction of the granite and Huronian.

Lake Ontario District.—In two localities in the Silurian.

Eastern Townships.—A number of localities in alluvion covering the Lower Silurian.

Maritime Provinces.—A number of localities in the Primordial and the Pre-Silurian.

The total value of gold exported in 1883 was \$911,383.

SALT.

Lake Ontario District.—In three localities in the Onondaga.

Maritime Provinces.—In eight localities in the Lower Carboniferous.

The total amount raised in 1883 was 197,185 bushels.

APATITE.

Lake Ontario and River St. Lawrence District.—A number of localities in the Laurentian.

Maritime Provinces.—In two localities in the Lower Carboniferous.

The total amount exported in 1883 was 14,478 tons.

PETROLEUM.

Rocky Mountain District.—In one locality in the Devonian.

Lake Superior District.—In one locality in the Tertiary.

Lake Ontario District.—In several localities in the Onondaga salt formation.

River St. Lawrence District.—In one locality in the Upper Silurian.

Maritime Provinces.—In three localities in the Lower Carboniferous. Albertite is found in five localities in the same formation.

The total amount of petroleum raised in 1883 was about 15,000,000 gallons.

GYPSUM.

Lake Superior District.—In one locality in the Devonian.

Lake Ontario District.—In two localities in the Onondaga formation.

Maritime Provinces.—In a number of localities in the Lower Carboniferous.

Newfoundland.—In two localities in the Lower Carboniferous.

The total amount mined in 1883 was about 160,000 tons.

NICKEL.

Eastern Townships.—In one locality, as millerite.

PLUMBAGO.

St. Lawrence District.—In several localities in the Laurentian.

ZINC.

Lake Superior District.—In three localities in the Nipigon series.

ASBESTOS.

Eastern Townships.—In three localities in the Silurian.

The above are most of the occurrences of the minerals in question, but it must not be supposed that their occurrence is limited to the localities mentioned. They may be considered as a few indications of an exceptionally large mineral development, that we hopefully look forward to in the near future.

XIII.

THE COALS OF CANADA.

BY H. A. BUDDEN.

The Dominion of Canada, lying between the Atlantic and Pacific Oceans, invites the commerce of the world to its shores, and in the near future, by means of the Pacific Railway, will offer rapid communication through its territory between all the countries bordering on those oceans. Steamships now carry on the principal traffic of the seas, and Canada is singularly adapted to attract them. Coal, the fuel they require, is abundantly supplied at the first ports they can reach on either ocean, at the lowest possible price and of excellent quality. The purpose of this paper is to indicate the position and extent of these valuable coal fields, and also to show that all across the continent, through Canada, coal is available in unlimited quantities.

I. CAPE BRETON, NOVA SCOTIA.

The Island of Cape Breton, lying at the mouth of the St. Lawrence, offers shelter for the navies of the world in Sydney Harbour, and supplies of coal from the collieries on its shores. The coal at Halifax is taken from the adjoining collieries of Pictou County. Without further preface, a short description will be attempted of each important field.

The Carboniferous system of Cape Breton comprises four distinct formations of variable thickness:—(1) Conglomerate. (2)

Carboniferous Limestone. (3) Millstone Grit. (4) Coal Measures. The coal measures consist of an accumulation of strata, comprising shale, sandstone and fireclay, with valuable seams of bituminous coal.

The coal field of Sydney, the most extensive in Nova Scotia, extends from Mira Bay in the east to Cape Dauphin in the west, a distance of thirty-one miles, being bounded on the north by the sea coast, and on the south by the millstone grit. This tract of country, about 200 square miles, is indented by bays and harbours, affording exposed sections of the coal measures in the cliffs, which rise from twenty to one hundred feet in height; the land attains a height of about one hundred and fifty feet, one mile from the shore. The sea is, however, gradually but steadily extending its grasp upon the shore. The total thickness of the coal measures does not exceed 7,000 feet.

The Sydney Mines district, on the west side of Sydney Harbour, contains some thirty-six beds or layers of coal, but only four of them of sufficient thickness to be economically worked, their aggregate thickness being about twenty feet. These measures extend to the great Bras d'Or in the west; and, though not quite continuous, being interrupted by faults, they may still be considered analogous. They lie almost flat, at an angle of from 5° to 7° , and extend under the sea. These sea areas are worked by the General Mining Association without difficulty, the overlying strata being impervious to water, and in the future the whole of the sea areas will be worked for a considerable distance under the water.

The Cape Dauphin district, on the west side of the great Bras d'Or, occupies an area of about two square miles. All the formations of the Carboniferous system are here found, between the southern flank of the hills of St. Anne and the entrance to the great Bras d'Or, and being squeezed or pressed within very narrow limits at their outcrop, by the upheaval of the syenitic rocks, dip towards the east from an angle of 12° to a vertical position.

The Glace Bay district has the fullest development of the measures of the eastern division, between Mira Bay and Sydney Harbour, and from it the identity of the seams and other mutual relations of the adjoining districts may be established. By far the greatest portion of this basin lies under the sea, but as the

dip is moderate and the metals favorable, a large portion of the coal will be eventually recovered. The seams that are known are eleven in number, from two to nine feet in thickness, comprising about fifty-one feet of coal. The direction of the dip varies as the seams proceed along their curved line of strike, but the angle of inclination rarely exceeds 5° . These measures extend from the north head of Cow Bay to Indian Bay, a distance of about ten miles.

The Cow Bay district, to the east, is separated from that of Glace Bay, by an anticlinal axis. The known seams are seven in number, with a total thickness of about twenty-nine feet. These seams are supposed to be equivalent to the Glace Bay measures. On the southern shore of Cow Bay, are several seams running across the narrow promontory of South Head, passing into the sea on the south side of the headland, where all traces of them are lost.

The Lingan Point district, between Indian Bay and Sydney Harbour, is separated from the Glace Bay district by an anticlinal. From the North Head of Indian Bay, the coal measures are exposed in the cliffs for a distance of five miles, with a strike of $N. 56^{\circ} W.$ and a dip of 12° . At Barasois, the strike begins to bend round to the west and the dip of the beds to increase, the former being $N. 80^{\circ} W.$ and the latter 17° . On the south shore of Sydney Harbour, the strike is nearly due west, and the dip from 30° to 39° . The Low Point shore, brings the outcrop of nine seams nearer to one another than in any other district, all except two being workable. The total thickness of coal is forty-one feet.

It is generally admitted that the McAulay seam of Cow Bay, the Phelan seam of Glace Bay, and the Main seam of Lingan, are identical. But great difficulties present themselves, in connecting these measures with those on the west side of Sydney Harbour. It is evident there are one or more faults under the waters of the Harbour, which have thrown the measures into their anomalous position.

These coal fields are now worked by several companies. The old Sydney Mines of the General Mining Association, have been in operation since 1827, but were worked in a measure since 1785 by various individuals. The coal of the Main seam has the

best reputation of all the coals of the Sydney field, but from other mines very excellent coals are being placed on the market. In order to give an approximate idea of the value of the Sydney coals, a few analyses are here given :—

SYDNEY MAIN SEAM.

Moisture.....	3.04
Volatile Combustible.....	31.14
Fixed Carbon.....	61.50
Ash	4.32
Sulphur, 1.24.	100.00

LINGAN MAIN SEAM.

Moisture	3.17
Volatile Combustible	26.86
Fixed Carbon.....	66.91
Ash	3.06
Sulphur, 7.10	100.00

ROSS SEAM, VICTORIA MINES.

Volatile Combustible	38.70
Fixed Carbon.....	58.40
Ash	2.90
	100.00

PHELAN SEAM, CALEDONIA MINES.

Volatile Combustible.....	33.00
Fixed Carbon.....	57.37
Ash	9.63
	100.00

BLOCK HOUSE, COW BAY.

Moisture	5.00
Volatile Combustible.....	33.80
Fixed Carbon.....	55.80
Ash	5.40
	100.00

McAULAY SEAM, GOWRIE MINES.

Moisture	1.80
Volatile Combustible	27.08
Fixed Carbon.....	60.45
Sulphur	3.42
Ash	7.25
	100.00

Of these coals the Sydney Main seam is the most westward of those worked. They vary in thickness, those at present worked being from 4 feet 6 inches to 9 feet thick. The total available coal of the area is estimated at over 800,000,000 tons.

Some other small fields of productive coal measures exist in Cape Breton at Port Hood, Mabou, etc., and in Richmond County, but no extensive development of them has taken place.

II. PICTOU COUNTY, NOVA SCOTIA.

Proceeding westward, the next important coal field is that of Pictou County. An undeveloped field exists in Antigonish County, but little is known of it. The Pictou coal measures are widely known on account of the immense thickness of the coal seams. Much attention has been given to the district; but, owing to disturbances and faults, it has proved very difficult to trace satisfactorily the relations that one part of the field bears to another. The total area is about thirty-five square miles. The district may be roughly described as forming an east and west synclinal, disturbed and shifted by north and south undulations, which expose the seams in irregular curves and basins, let down on all sides, among rocks of an older age. The East River separates the field into about equal divisions, the western portion containing the principal seams of coal. Some of these have been long worked at the Albion, Acadia and Intercolonial Mines. The only mines now worked on the eastern side being those of the Vale Company, situated about six miles from the East River. The lower group of important coal measures at the Albion Mines contain the following seams:—

	Ft.	In.
Main Seam Coal.....	34	7
Strata.....	148	0
Deep Seam Coal.....	22	11
Strata.....	100	0
Third Seam Coal.....	8	0
Strata.....	113	0
Purvis and Fleming Coals	6	9
Strata	134	0
McGregor Coal.....	12	0
Strata.....	211	0
Stellar Oil Coal	5	0

Other seams have not been proved over much territory. The two first upper seams have been worked for years at the Albion Mines, but unfortunately the mines are now abandoned and full of water, in consequence of a disastrous fire, which occurred a few years ago, attended with great loss of life. Since the fire, the company has opened extensive collieries on the Third and McGregor seams. This coal area is divided from the areas worked by the Acadia and Intercolonial Companies by an immense fault, known as the McCulloch Brook fault.

The Main seam worked by these latter companies is considered the equivalent of the Main seam of the Albion Mines, as the underlying seams have been found at about equal distances in the measures, and the overlying shales of both areas are of immense thickness and quite similar. The Main coal however, of the Acadia Colliery is only twenty feet thick, the Deep seam eleven feet. The texture of the coal is more compact and with less foreign matter. The total area of coal worked by these three companies does not very much exceed eight square miles.

The Vale Coal Company have opened upon two of these seams: the McBean, in thickness eight feet; and the G. McKay, in thickness six feet. Several other seams of value are known to exist, but the difficulties in the way, through numerous faults and the thickness of the cover, render an estimate of the value of the eastern portion of the Pictou field almost impossible.

The following analyses taken by Mr. Broome will indicate the value of the Pictou coal:—

	ALBION. Main Seam.	ACADIA.	INTERCL.	VALE.
Moisture.....	1.296	2.100	1.560	.860
Volatile Combustible..	25.442	32.274	31.694	25.870
Fixed Carbon	61.550	57.570	60.320	60.030
Sulphur	.861	.596	.426	.850
Ash.....	10.250	7.550	7.560	13.240
	100.000	100.000	100.000	100.000

The Pictou measures, are inclined at various angles, from 15°, to 36°, in consequence of which, expensive and heavy machinery is required for hoisting and pumping. And as the coal throws off a great deal of gas, ventilation also forms a large item of the cost

of coal. The coal is hard and compact, weathering well under exposure. It is much esteemed for iron-working and also for locomotives and other steam purposes. The percentage of ash is heavy, but its freedom from sulphur and clinker renders its use very easy on grate bars, etc. It forms an excellent coke. It is, however, difficult to estimate the amount of available coal in Pictou County. Some place it as low as 250,000,000 tons, but any figure must be conjectural.

III. CUMBERLAND COUNTY, NOVA SCOTIA.

The important district of the Cumberland coal measures has only recently been developed on a large scale. The opening of the Intercolonial Railway, through its coal fields, has rendered important seams of coal available. The productive measures extend from the Joggins, on the Bay of Fundy, for more than twenty miles east towards the base of the Cobequid Hills. On the shores of the Bay of Fundy, the coal measures have been carefully examined by Sir Charles Lyell, Sir William Dawson, Sir William Logan and many others. The exposure is of immense thickness, amounting to more than 14,000 feet, extending from the Marine Limestones of the Lower Carboniferous to the top of the coal formation. The beds that appear at the Joggins, can be traced north-eastward for many miles. They no doubt extend with some modification, in the details, quite to the coast of Northumberland Strait. The two principal seams at the Joggins, of four and six feet, were opened some years ago by the General Mining Association of London, England. The extension of these seams inland forms the northern edge of the coal field, and several openings have been made, but none so far have been worked on any extensive scale. From the shore to Springhill, little is known of the geological conditions of the country, as the presence of woods, and the depth of the soil, or drift, have prevented much exploration in a promising district.

The only portion of this inland region in which important measures are exposed is about the Springhill district, twenty miles eastward from the Joggins coast. Here, it would seem, that the great synclinal, apparent on the coast section, runs out to the surface exposing, among others, the valuable seams of coal

now worked by the Springhill Company. On going eastward from Springhill, the measures turn gradually to the north. At present the area of this coal field has not been ascertained with precision; it may be put down at about 300 square miles. Any estimate of the quantity of coal would be idle.

In the country extending eastward to Pictou, the measures of the upper coal formation appear, and it is not unreasonable to suppose that productive measures may be found, at a workable depth, at some future day. This district embraces an area of some 500 square miles.

The coal seams now traced on the Springhill area, on an out-crop of about three miles and a half, consist of:—

	Ft.	In.
North Seam Coal.....	13	0
Strata.....	105	0
Coal.....	6	0
Strata.....	130	0
Coal.....	2	4
Strata.....	185	0
Main Seam Coal.....	11	0
Strata.....	80	0
South Seam Coal.....	11	0
Three small Seams of Coal.....	9	3
To strata.....	466	0

The three large seams above are now worked on an extensive scale, by the Cumberland Coal and Iron Mining Company; their production this year will exceed 200,000 tons.

An analysis taken of the Main seam will indicate the value of these coals:—

Moisture.....	1.399
Volatile Combustion.....	31.255
Fixed Carbon.....	61.586
Ash.....	5.760
Sulphur, .808.	100.000

The Carboniferous system extends over a large portion of New Brunswick, but it contains, so far as known, no seams of coal of sufficient magnitude to be successfully worked, alongside of the very productive measures of Cumberland County.

From New Brunswick westward, through the Provinces of Quebec and Ontario, no coal measures are to be found. These Provinces, however, are abundantly supplied with coal, coming by the St. Lawrence River to Quebec and Montreal, from the Lower Provinces and from Great Britain; while, by the chain of great lakes and the upper St. Lawrence, all points of Ontario are supplied with coal from the exhaustless fields of Pennsylvania, Ohio, Indiana, and Illinois. In these States the strata lie horizontally, for the most part, and the coal is worked as cheaply as any in the world.

IV. NORTHWEST TERRITORIES.

The 97th west meridian separates, pretty exactly, the coal-bearing formations of America into two classes. Eastward are found the Carboniferous rocks. Westward, in the various horizons of the Secondary and Tertiary rocks, coals and lignites extend to the shores of the Pacific Ocean.

Their widest development in the Northwest Territories is about the 49th parallel of latitude, extending eastward from the Rocky Mountains to the Souris River country, and from this point, inclining towards the Rocky Mountains northward for hundreds of miles. Outcrops have been proved at many points; on Souris River, on the Saskatchewan, Bow, Belly, Peace and Athabasca Rivers. As many workable seams of from four to ten feet in thickness have been developed, with a gentle inclination westward, the enormous extent of these measures is apparent at a glance. The general character of these coals improves in a westward direction, until among the foldings and upheavals of the Rocky Mountains, anthracite is reached.

Analyses of coals, from some of these districts, will more clearly indicate their character:—

	SOURIS.	MEDICINE HAT.
Water.....	15.46	17.70
Volatile Combustible.....	37.97	28.63
Fixed Carbon.....	41.21	49.83
Ash.....	5.36	3.84
	100.00	100.00

	BELLY RIVER.	BOW RIVER.
Water.....	6.52	12.37
Volatile Combustible.....	31.03	32.33
Fixed Carbon.....	56.54	46.39
Ash.....	5.91	8.91
	100.00	100.00

	SASKATCHEWAN RIVER.*	PEMBINA RIVER.†
Water.....	7.82	11.88
Volatile Combustible.....	31.35	28.66
Fixed Carbon.....	54.97	57.25
Ash.....	5.86	2.21
	100.00	100.00

	PEACE RIVER.	ATHABASCA RIVER.
Water	2.10	10.58
Volatile	21.54	29.29
Fixed Carbon	71.63	53.69
Ash	4.73	6.44
	100.00	100.00

V. BRITISH COLUMBIA.

The mainland of British Columbia has not been regularly explored for coal.

The Tertiary measures of Puget Sound are continuous north of the 49th parallel, and underlie the low country of the estuary and valley of Fraser River. Lignites and coal formations, of Tertiary age, also cover great tracts of the interior, in an area of not less than 12,000 square miles. An outcrop in the Nicola valley, near the Coldwater, shows a seam of valuable coal. An analysis made of it gives:—

Volatile Combustible.....	36.065
Fixed Carbon.....	61.270
Ash.....	2.645
	100.00

It is, however, on the Pacific, in Vancouver Island, that the

* Thirty miles west of Edmonton.

† Fifty-six miles west of Edmonton.

most valuable deposits of coal, on the whole of the North and South American Pacific coasts, are to be found.

The coal measures of Vancouver Island, have only been partially developed. The products of the mines now in operation exceed 300,000 tons per annum; the quality is so excellent that large quantities are shipped to San Francisco, where it commands the highest market price. The best known districts, those of Nanaimo and Comox, extend along the eastern coast about 130 miles. Outcrops have been found at various other points, and on the western coast at Quatsino Sound and Alberni Canal, but the abundance of the eastern field has prevented development.

Queen Charlotte Islands, to the north, have extensive indications of coal measures, but they have been very cursorily examined. Two samples from these have been analyzed and are anthracite in character:—

	Sample 1.	Sample 2.
Water.....	1.60	1.89
Volatile Combustible.....	5.02	4.77
Fixed Carbon.....	83.09	85.76
Sulphur.....	1.53	0.89
Ash.....	8.76	6.69
	100.00	100.00

It is rather difficult to give any detailed statement of the Nanaimo and Comox coal fields. Particulars can only be gathered from the records of the Geological Survey. The collieries worked there are mainly controlled by Mr. Dunsmuir, and information is not very readily given. The Nanaimo district is separated from that of Comox by crystalline rocks in the neighbourhood of Nanoosa Harbour. The measures are irregular, the Douglas and Newcastle seams of the Vancouver Mining Company showing the following strata:—

	Ft.	In.	
Hard-blue Shale.....	12	0	
Conglomerate.....	12	0	Ft. In.
<i>Douglas Coal</i>	2	6	@ 6 0
Conglomerate.....	72	0	
Sandstone.....	84	0	
<i>Newcastle Coal</i> mixed with Shale.....	8	0	

The strike is S. 67° E., dip 16° and variable.

The seam at Wellington Mines is composed of:—

	Ft.	In.	
Coal	1	4	
Shale	0	1	
Coal	1	10	
Shale	0	3	Ft. In.
Coal	6	0 @ 7	0

lying in dark-grey sandstone. The strike is S. 29° E., dip from 4° @ 6°.

The Comox district has not been worked extensively, the productive measures at the Union Mines showing ten seams of coal, with a total of 29 feet 3 inches, the thickest seam being ten feet. The strike of this coal is about N. 30° @ 35° E., dip 5° @ 16°. The measures underlie, in part, the waters of the Strait and have been traced on to Texada Island. They will, doubtless, be mined under the sea for a considerable distance. Variability appears to be equally found in all parts of the Vancouver coal fields, and the Diamond drill is required to prove the seams from point to point. This will entail very considerable expense on colliery owners as well as explorers.

The character of the coal can be gathered from the following average analyses:—

	Slow Coking	Fast Coking.
Water.....	1.47	1.47
Volatile Combustible.....	28.19	32.69
Fixed Carbon.....	64.05	59.55
Ash.....	6.29	6.29
	100.00	100.00

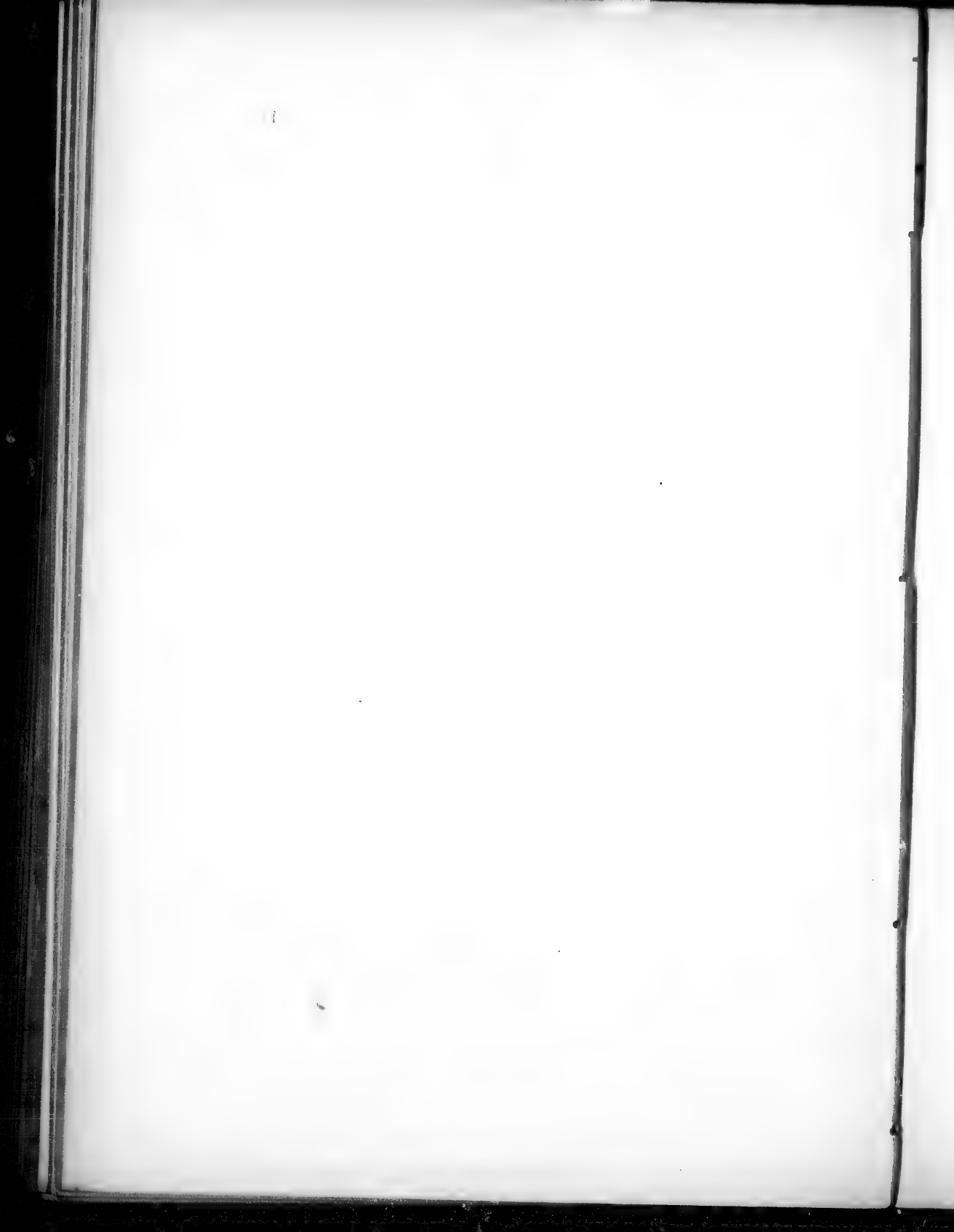
Texada Island is celebrated for its immense deposits of iron. It is a coarse granular magnetite; it contains 68 per cent. of iron, .003 of phosphorus. The bed is from 20 to 25 feet thick.

Having thus carried the inquirer from ocean to ocean, it may be well to indicate the sources from which further information can be obtained. The records of the Geological Survey, comprising the labours of Sir Wm. Logan, Messrs. Richardson, Hartley, Robb, Fletcher, Dr. Harrington, Dr. Selwyn, Dr. Geo. Dawson, and others, give details of great interest. Sir William

Dawson in "Acadian Geology" describes Nova Scotia. However, much remains to be done.

The early completion of the Canadian Pacific Railway will greatly facilitate and stimulate the search for coal in the mainland of British Columbia. The line from Vancouver City, the Pacific terminus, to the summit of the Rockies, some five hundred miles in length, will require a large amount of fuel, and deposits are known to exist within a short distance of it.

The demand for coal from shipping will be very extensive in the near future. The comparative merits of San Francisco and Vancouver City, as coaling stations, are very marked. The former, dependant on importations from abroad, will always suffer from its high cost of \$6.50 to \$7.00 per ton; the latter, with abundance in its neighbourhood, can depend on constant supplies at one half the cost. This fact will tend greatly to increase the importance of Vancouver City, and draw to it the commerce of the Pacific Ocean.



XIV.

THE DISTINCTIVE FEATURES OF THE VARIOUS NOVA SCOTIA COAL FIELDS.

BY EDWIN GILPIN, JUN.

My purpose in the following notes is to make a general comparison of the distinctive features of the three leading Nova Scotia coal fields. They have largely contributed to the present knowledge of the conditions of deposit, etc., distinguishing the accumulation of the productive measures, and their beautiful natural exposures along miles of sea-cliff have revealed this information in a clear and positive form.

Nowhere possibly in the world can the history of the Carboniferous be more clearly read than at the Joggins shore, where each rock-layer can be studied for mile after mile, and the succession, unbroken by faults and flexures, is as regular as the numbered pages of a book. Nearly all the leading geologists of this continent, and several of their best known English brethren, have visited this classic shore, where can be seen the great Carboniferous system of Acadia in continuous sequence, making with its five subdivisions a thickness of no less than 14,700 feet of strata.

Equally clear is the record in Cape Breton, where the surf of the Atlantic keeps renewing sections which show each coal bed and its enclosing strata, as they were accumulated into the present coal field. Under these favorable natural conditions it is not surprising that considerable progress has been made in the

survey and knowledge of our provincial coal fields. The leading investigator has been Sir William Dawson, whose account of the Nova Scotia Carboniferous has laid down the outlines which others are filling in.

Roughly speaking, the Carboniferous and Pre-Carboniferous rocks divide the Province between them, there being few deposits obscuring the former. The latter rocks occupy the half of the Province facing the Atlantic, and the remainder is in great measure underlaid by the various divisions of the Carboniferous.

The Carboniferous stretch almost uninterruptedly through the northern part of the Province, and form the outcrop of a great basin of measures of this age, which extend under Prince Edward Island and the Gulf of St. Lawrence from Gaspé to Newfoundland.

In this band of measures, extending through 200 miles of Nova Scotia, there are three principal coal fields. That of Sydney, situated on the east shore of Cape Breton, where the Carboniferous disappear beneath the Atlantic. About the centre of the band we find the Pictou coal field, while at the western end is the Cumberland district. There are smaller and less important coal fields which may be omitted from these notes.

The first point that strikes the observer is the presence in the three fields of synclinal troughs, having a general east and west course. In the Sydney coal field there are four well-marked synclinals, dipping seaward or away from the outcrops of the older strata, the axes of these synclinals being on the prolongation of the ranges of the older rocks, and modified by the effect of their extension under the Carboniferous strata. Curiously enough, these plications are not accompanied by faults, except at one point where the coal measures closely approach the syenites of Cape Dauphin, although three of the synclinals present for a short distance steep dips on one side. Apparently this freedom from faulting is due to the fact that, on the Atlantic side, there were no older bounding rocks resisting and complicating the flexures which must have gradually died out as they extended seaward.

In the Pictou district, we find the main synclinals preserving this east and west course, but their formation was connected with unusually heavy faulting. The limits of the coal field are sharply defined by faults bringing up unconformably the strata below

the coal measures. The longitudinal east and west folding was followed by transverse flexures of almost equal magnitude, so that the district presents, generally speaking, three subordinate basins strung along a predominating synclinal. Here the coal field has been let down among the Lower Carboniferous, and ridges of older strata. To this we owe the preservation of the coal field as now presented; for it has evidently suffered severe erosion, and at one time extended far beyond its present limits.

In the Cumberland district, we have the coal measures presented in one grand synclinal eighteen miles broad at the Joggins shore, and twenty-two miles in length until obscured at the flattened apex by the upper coal measures. On the north side, the basin runs with great regularity for eighteen miles. On the south side, subordinate synclinals are presented which, with accompanying faults, are related to the spurs and projections of the metamorphic series of the Cobequids.

From a study of the sections of the Sydney coal field, it would appear that in the Lingan district—the middle of the coal field, if the ancient boundaries were restored—we find the maximum of coal and the minimum of strata. If, as would appear to have been the case, these strata are largely composed of the re-worked millstone grit beds, the depositing streams would have been short and have flowed principally from the north and south sides of the district. Still in the earlier horizons this was not markedly so, for we find layers of bituminous and fossiliferous limestone, most developed in the centre, but stretching with great regularity almost from end to end of the district.

In Pictou County we have a remnant of a great coal field, unrivalled in the thickness of its strata—estimated by Sir W. Logan at 5,567 feet—as well as in the corresponding development of its coal beds. Its comparatively limited area, the presence of faults, and its great thickness, have scarcely afforded one complete section, and comparisons cannot be drawn satisfactorily with other districts. The most noticeable point in the Pictou coal field is the presence in the middle of the district of a great mass of shales, argillaceous and carbonaceous, about 1,500 feet in thickness, carrying sixty-six feet of coal and forming the lowest horizon. This mass gradually becomes interstratified with sandstones toward the east and the west, but continues through

the field to be largely composed of shales. There would appear to have been periods allowing of immense accumulations of fine detritus, interrupted only by coal accumulation; while on each side the currents, etc., permitted the usual alternations of sandstones, coarse and fine, with clayey and carbonaceous matter.

These curious conditions of deposition have been fully referred to by Dr. Dawson in his "Acadian Geology," where he describes a great mass of shingle torn from the millstone grit, lying to the north of the ancient Carboniferous shore, and forming a breakwater behind which, over large areas, the collections of fine detritus and unusually large coal beds were permitted to accumulate. In this district along the present shore are seen numerous encircling beaches, which shelter similar accumulations of soft argillaceous plant-laden mud.

In the Cumberland coal field, the Joggins section presents a long-continued alternating deposition of shale and sandstone permitting the formation of coal beds at frequent intervals but of insignificant dimensions,—there being sixty-seven coal beds in 4,670 feet of strata, only two of which are of workable size. As the measures are followed eastward away from the Joggins, which marked the western end of the original coal field, the seams improve in size, as will be noticed further on.

Nor were the conditions of coal-deposition less varied than those of the containing strata. In the Cape Breton district coal-forming horizons occurred frequently, there being in the Glace Bay section, twenty-four seams contained in 1,314 feet of strata. The larger workable seams, seven in number, are separated by intervals of strata varying from ninety-five to 350 feet. In Pictou County the lower 1,324 feet contain fifteen beds, yielding 119 feet of coal. In the upper portion, 4,253 feet contain twenty-one beds with but thirty-nine feet of coal. In Cumberland, at the Joggins section, there are sixty-seven coal seams, only two of which are workable; while at Springhill there are twelve beds in the lower 1,000 feet of measures, which are largely argillaceous, yielding fifty-one feet of coal.

Denudation has swept away all the upper coal measures in Cape Breton County, and we cannot say how much of the upper part of the productive measures has also gone. The resemblance between the lower horizon of the Pictou coal field, and the Spring-

hill section of the Cumberland field is striking; and this, taken with the development of sandstones and comparatively limited coal growth of the upper sections of both coal fields, lends force to the argument that the productive coal measures of Cumberland and Pictou were once continuous through Colchester County.

If such be not the case there must have been during the coal-producing period large areas particularly favouring the growth of the coal vegetation and the accumulation of very fine argillaceous and carbonaceous shales, surrounded by and merging into tracts over which a much larger proportion of sand beds was formed.

When it is noticed that the productive horizon in Cape Breton succeeds immediately to the millstone grit and is contained in 1,350 feet of strata, the question naturally arises if, when so similar a feature is observable in the three districts, the Cape Breton coal field may not at one time have had a total thickness of strata equalling that recorded in Pictou and Cumberland.

The coal itself presents some features of difference. Broadly speaking the coals of Cape Breton are more bituminous than those of Pictou and Cumberland. The coals of these districts are rather of the free-burning type, although in some cases coking, but not, as in the case of the Sydney coal field, almost invariably coking and adapted for gas making.

The generally higher percentages of ash in the Pictou and Cumberland coals may be connected with the presence of the including beds of shale already referred to, as compared with the small ash percentages of the Cape Breton coals associated with a larger proportion of sandstone beds. The lesser thickness of the Cape Breton coal measures and the more bituminous nature of the coals may be contrasted with the free-burning characteristics of the western coal included in measures of much greater thickness.

The following average of analyses from a paper of mine on Canadian coals will serve to show these differences:—

	Cape Breton.	Pictou.	Cumberland.
Moisture.....	.75	1.19	1.46
Volatile Combustible matter....	37.26	29.10	33.69
Fixed Carbon.....	58.74	60.63	59.35
Ash.....	3.25	9.34	5.50

I am not aware that as yet these coal fields present any distinction in their fossils calling for special notice. This subject, however, has not yet received a share of attention equal to that expended on the economic questions that have presented themselves, and the number of those in the Maritime Provinces qualified to labour in this interesting comparison is extremely limited.

The foregoing brief notes describe the most striking differences between these districts; and they are perhaps more justly considered due to local differences of the conditions of disposition which extended over an immense area, than as marking distinctions between individual and isolated coal fields.

XV.

*RESULTS OF PAST EXPERIENCE IN GOLD-MINING
IN NOVA SCOTIA.*

BY EDWIN GILPIN, JUN.

I. VEINS AND CONTAINING STRATA.

The gold fields of Nova Scotia stretch from Cape Canso to Yarmouth, along the whole Atlantic coast of the Province, and vary in width from ten to forty miles. The total area over which gold is found may be estimated at about 7,000 square miles, half of which is occupied by granitic rocks.

The auriferous measures may be divided generally into two series. The upper one is composed principally of black pyritous slates, with occasional beds of quartzite and some auriferous veins. Its thickness is estimated at three thousand feet. The lower series is made up of alternating beds of slates and quartzites, and compact sandstones, sometimes felspathic, and is estimated to be 9,000 feet thick. It is in this latter section that the productive veins are found.

The granite rocks stretch regularly the whole length of the gold fields, and are evidently intrusive. The granite has all the characters of a plutonic rock in its want of stratification, its frequent porphyritic appearance, its passage into graphic granite, etc., and closely resembles in lithological characters the intrusive granites of Quebec and New England. The granite is older than the Carboniferous strata for its debris is found in them, and it penetrates measures of oriskany age.

The auriferous strata are spread around the granite masses in a series of undulations, having a general east and west strike. The auriferous quartz deposits are presented wherever the undulations have been worn down into the lower series. Being conformable to the strike of the measures, they were at first believed to be beds similar to those known to be auriferous in the Carolinas and elsewhere. On more careful study, however, they were recognized as true veins.

It may be considered that the force upridging these undulations would leave fissures between beds of varying degrees of flexibility, etc. Subsequently these fissures, filled with quartz, were presented along the denuded anticlinal crowns. Corrugated beds, and rolls of quartz are found around the apices of the undulations where the pressure was equally great, but the opportunity of upward movement was not allowed. Internal evidence also points to the vein origin of these deposits. The quartz is often crystalline and banded, and holds portions of the enclosing walls. The veins break off abruptly and begin again. There are "feeders" radiating from the veins, and often connecting them, and the veins, preserving their strike parallel to the strata, sometimes pass obliquely from one bed to another.

Subsequently movements and dislocations have shifted parts of the anticlinals and have given rise to cross-country veins, some of which are auriferous, and to veins infringing upon and altering the original lodes, but following the same strike.

The auriferous veins vary in thickness up to six feet, but veins of barren milky quartz, due to subsequent movements, are often found twenty feet wide. The usual size of the veins that are worked varies from four to fifteen inches. The date of the filling of these auriferous veins cannot be definitely settled; they are, however, Pre-Carboniferous, for at Gay River, the indurated Lower Carboniferous conglomerates, resting directly on the auriferous measures, carry scales and small nuggets of gold, sometimes in quantities sufficient to make mining profitable.

II. OCCURRENCE OF THE GOLD.

The gold occurs principally as "free" or coarse gold in grains visible to the naked eye, also in filaments between the planes of

the quartz and slate. The associated minerals frequently hold notable amounts of gold. Few crystals of gold have been found in Nova Scotia. One from Tangier was a rhombic dodecahedron with bevelled edges, others are octohedra with rounded planes. The principal minerals found in the auriferous quartz veins are the sulphides of iron, zinc, copper, lead, and antimony. Arsenical iron pyrites is also common, and molybdenite, native copper, barite, calcite, etc. These are not present in amounts of economic value; but, as they sometimes carry as much as 100 ounces of gold to the ton, attempts are now being made to concentrate them from the quartz tailings with a view to their treatment at Swansea.

The distribution of the gold in the veins may be termed capricious. Few carry a uniform yield over a length exceeding 500 feet. While the vein for a long distance may be auriferous, there are generally one or more zones of quartz much richer than that on each side. These zones, or "pay streaks," do not appear to be the effect of any law that has yet been applied to our mines.

It may be surmised that the gold, originally distributed in the surrounding strata, was at these points more accessible to transporting agencies, or that subsequent changes permitted the concentration of the gold of the veins along certain favouring lines. These zones are inclined at every angle, and are of very varied length and width. One has been followed nearly 600 feet from the surface without showing signs of exhaustion. The surrounding quartz yielded from 2 to 6 dwts. of gold to the ton, while the pay streak ran as high as 20 ounces to the ton. These rich portions of the veins sometimes become poor at a shallow depth, or a lucky discovery opens one which gave on the surface no evidence of its proximity.

III. ALLUVIAL GOLD.

At first, Nova Scotia miners had great expectations of rich gold washings, but their hopes were not realized. Near Lunenburg, where there are exposures of auriferous veins on the shore, denudation enriched the sands, but the supply was soon exhausted. It is well known that at many points the drift shows gold, but no attempts have yet been made to test the present

lines of erosion or the old water courses, although the subject is well worth a systematic investigation at several points.

The gold districts present everywhere the signs of extensive ice action. The striæ run between S. 20° W. and S. 28° E. magnetic, or nearly at right angles to the general strike of the strata. There appear to have been two periods of attrition and transportation. The earlier one has left great "boars' backs" from 50 to 150 feet high, with a general north and south course. They hold boulders of quartzite, sandstone, granite, etc., in clay with layers of sand and gravel, some of the material being derived from sources over fifty miles distant.

A second and more local action is also visible and is practically interesting, as by its means the auriferous veins are often discovered. This power, possibly that of ice acting on a coast line gradually changing its level, has carried the quartzites, slates, etc., for distances varying up to 1,800 feet, on a course corresponding closely with that of the striæ.

Miners finding auriferous boulders of quartz trace them to the north on the line of the ice grooves, and frequently discover lodes agreeing in every particular with the first-found boulders. So local is this action, that in several districts men have made a living by breaking up these auriferous boulders when, at a short distance away, a day's search would not be rewarded by a sight of gold.

IV. THE AGE OF THE GOLD-BEARING STRATA.

For many years the Atlantic metamorphic series were regarded as immediately preceding the Devonian; gradually, as the necessary divisions were recognized, the auriferous series assumed an older position, and the following estimate of their age appears to be based on the best available data.

The Menevian, or Barrande's Stage C of the Bohemian Primordial, are comparable here with the Acadian series of St. John, New Brunswick. The Atlantic coast series is considered to precede these. The geologist can in this case learn but little from fossil evidence. Mr. Billings referred, with hesitation, to the genus *Eospongia*, and to casts of *Orthis*, certain nodular bodies and markings found at Waverley by Prof. Hynd. Dr. Dawson re-

marks that these nodular bodies and markings may be compared with the problematical object from the Eophyton sandstone of Sweden, described by Linnarson under the name of *Astylospongia radiata*, but he considers them fucoids with radiating fronds, allied in form to Hall's *Phytopsis* from the Bird's Eye limestone, or to Linnarson's *Scotolithus* from the Eophyton sandstone, and has given them the name of "Astropolithon." Markings referable to *Scotolithus* have been found at St. Mary River.

Judging from this evidence it would appear that the auriferous strata are to be included in the Cambrian. The fossils may be compared with those of the Fucoidal sandstones of Sweden which underlie the equivalent of our Acadian series. This would make them probable equivalents of the Lower Cambrian or Longmynd series of Europe.

V. MINING AND MILLING.

The system of mining generally followed in Nova Scotia, although of a temporary character, is well contrived for cheaply and effectually meeting the requirements of the district. When it is determined to open a quartz mine, shafts are sunk in the vein, which sometimes varies considerably from a perpendicular dip, at distances apart varying from 50 to 100 feet. When the central shaft has reached a depth of about sixty feet, slopes are at once carried away from it to and beyond the side shafts, which are then used for hoisting, etc. No leading levels are ever driven, nor, as a rule, is any pretence made at blocking out ore for a steady mill supply.

Formerly it was customary to remove at one operation the vein and enough of the wall, if the vein happened to be narrow, to give a working space of about three feet in width. This was found to cause a serious loss of gold; and it is now usual to take away, by underhand stopping, enough of one wall to allow working room until several hundred square feet of the vein are exposed. This is taken down at one operation, and sent directly to the mill. The strata are very close, and generally dry, and present little difficulty in timbering. The latest improvements in explosives, drills, pumps, etc., are used whenever their introduction is seen to lead to economy.

The quartz mills of the Nova Scotia gold fields are similar to those in general use in Australia and California. They contain from ten to twenty-five stamps, arranged in batteries of five stamps each. The stamps are raised and dropped in oblong iron boxes, called "mortars," provided with an opening in front for introducing the quartz, and one behind covered with a fine wire cloth, through which the pulverized quartz is driven by a stream of water. They weigh from 600 to 750 lbs. each, and are lifted by cams on a horizontal shaft, and fall at a speed of from forty-five to seventy-five drops per minute for each stamp.

Mercury is fed into the mortars, and the coarser gold is amalgamated, and retained within the mortars, around the circular dies on which the stamps fall. The finer gold and part of the unutilised mercury passes through the screens and over amalgamated copper plates which retain it, while the quartz, etc., flows away. From eighty to ninety-five per cent. of the gold originally present is retained by these means, the skill of the mill manager having much to do with the success of the operation.

The cost of mining varies from 80 cents a ton in the open cast slate belts, carrying auriferous quartz, up to \$15.00 a ton, in small veins three or four inches wide, in very hard rock. The cost per ton of crushing with water power varies from 60 cents to \$1.00; with steam power the cost is somewhat higher.

VI. HISTORY OF NOVA SCOTIA GOLD-MINING.

The discoveries of gold in California in 1848, in Australia in 1851, and in British Columbia in 1858, prepared the minds of the public to receive with alacrity the proclamation of a new El Dorado. Miners who had returned from these gold fields frequently remarked on the presence of quartz veins, and Sir W. Dawson, writing in 1855, alluded to the prospect of finding gold on the Atlantic coast.

It was not, however, until the year 1861 that the public learned how accident had revealed the precious metal, that had lain for a hundred years undiscovered beneath their feet. In a short time, men were seen prospecting everywhere, and numerous localities were found to show surface gold and auriferous veins. The

miners soon exhausted the loose gold in the tops of the lodes, and found themselves confronted by the rock-bound quartz veins, which scarcely yielded to the fiercest attacks of pick and hammer. The sudden revelation that gold could be won only by hard work, and by the outlay of capital on areas larger than those they had received (which were intended for alluvial gold) rapidly damped the ardour of those who sought fortune at a bound.

A large number of companies were then formed, some of which did hardly any work, while others started on rich veins and made good returns. Under these circumstances a maximum yield of 27,000 ounces was reached in the year 1867.

Too many of the companies taking little heed for the rainy day which comes to all mining ventures, spent their profits in good dividends; and, when their galleries showed barren quartz, shareholders refused to pay assessments, so that many really good mines were compelled to stop work. The careless treatment of the quartz in the mills also contributed to the difficulties caused by poor ores: for gold was frequently allowed to escape in quantities which would have greatly assisted the companies in tiding over a temporary want of rich ore.

Some of the more intelligent of the adventurers realizing these facts began to improve their mining economics above and below ground, so that we have properties that have been worked continuously since the early days. The improvements thus effected may be judged of from the fact that better profits were made from an average yield of 12 dwts. to the ton than a few years before, when the average was 5 to 10 dwts. higher.

However, by the year 1872 the majority of the companies had stopped working, and Nova Scotia mining entered on a new phase. The agents of these companies now began to let their mines to parties of workmen called "tributors." For several years they continued to work the mines already opened, and the richer parts of new veins.

In the year 1879, American capitalists began to seek investment here, and we find our mines again reverting to companies. Some discredit has been caused by unscrupulous adventurers who have sold worthless properties, and caused heavy expenditures without return, but whenever caution has marked the purchase, and skill and economy guided the mining, the results have been satisfactory.

Thus during the past three years, the Salmon River Mine has returned 10,726 ounces of gold from 14,370 tons of quartz. The Stormont Mine has within two years yielded 3,400 ounces of gold from 1,265 tons of quartz, and the other districts have yielded similar returns.

Attention is now being turned to what are termed low-grade ores: that is beds of auriferous slate with veins of quartz, yielding averages of 4 to 8 dwts. of gold to the ton. These low-grade belts are found in many of our districts and are frequently of great extent. The cheapness with which they can be quarried has already permitted the profitable crushing of much of this ore. The future of our gold-mining, in my opinion, lies as much in working these belts by careful mining and large mills, as in the smaller and richer, but more uncertain, veins hitherto mined.

Our latest quartz mills built on the models most approved of on the Pacific coast now save ninety per cent. of the free gold in the quartz. The tailings are concentrated for the treatment of the auriferous metallic accessories, and improved pumps, drills, explosives, etc., all unite to facilitate the treatment of large quantities of low-grade ores for a return more assured and uniform than any to be anticipated from vein-mining. This is apparent from the fact that, during the year 1883, the mines averaged \$2.84 a day from 25,954 tons of quartz, yielding 10 dwts. 21 grains a ton,—about one half the average that was got per ton during the early years of our gold mining.

The effects of intelligently directed capital are already being felt in a steadily increasing yield of gold, so that with a large extent of country containing auriferous strata, and numerous proved districts, we anticipate a permanent and profitable future for the gold-mining interests of Nova Scotia.

XVI.

THE PHOSPHATE INDUSTRY OF CANADA.

BY ROBERT C. ADAMS.

In the year 1840, Liebig first called attention to mineral manures by showing that sulphuric acid made them soluble. It is supposed that the acid acts mechanically, dividing the particles of the mineral to a great degree of fineness, thus making it available for the nourishment of plants.

Every net ton of wheat contains about 16 lbs. of phosphoric acid and the average soil contains about 68.6 lbs. to the acre, or just enough to supply the phosphate to 4.16 tons of wheat. The exports of wheat from Montreal in one season are estimated to have contained 2,500 tons of phosphoric acid, to supply which would require 7,500 tons of Canadian apatite containing 75 per cent. of phosphate of lime. To secure production it is evident that this element must be supplied to the soil, and the demand for phosphates constantly increases as soils become exhausted and knowledge of scientific farming is extended.

Phosphates were first obtained from Estramadura in Spain. Then the coprolites of Cambridgeshire were used. In 1867, the discovery of phosphates was made in South Carolina, and since then 2,250,000 tons have been mined, 355,000 tons having been produced in 1883. Supplies have also been obtained from Norway, France and some of the West India Islands. The manufacture of superphosphate, made by mixing pulverized phosphate with sulphuric acid is largely carried on in Great Britain,

Germany and the United States. It has been attempted at Brockville, Ontario, and the establishment of works near Montreal is at present under consideration. In 1829, apatite appears to have been mentioned by Lieut. Ingall of the 15th Regiment, as existing near Lièvres River in "immense quantities aggregated in veins running through the calcareous spar." In 1847, Dr. T. Sterry Hunt reported its existence in North Burgess, Ontario, and, about the year 1860, 100 tons was shipped from this region, but the vessel was wrecked on her voyage to England.

About 1863, efforts were made to work extensively in North Burgess. English and American capitalists purchased properties near the Rideau Canal, paying sometimes as much as \$300 per acre. Expensive machinery, skilled engineers and chemists were sent to prosecute the work. The deposits were found to be uncertain and limited in size, and many difficulties arose in the treatment of the rock phosphate, owing to its hardness and to the presence of fluoric acid, which proved injurious to the workmen employed in its manufacture. For a time the industry was abandoned, but, about the year 1872, the growing demand for phosphates led to an advance of price, and mining on a small scale was soon afterwards undertaken by many owners of lands between Perth and Kingston, Ontario. In 1872, Mr. Garrett, of Ottawa began to mine on a small scale near Lièvres River, and Mr. Gerald C. Brown opened some properties in that region in 1875. Later in the same year, the Buckingham Mining Company commenced extensive operations. Mr. Miller also worked in Templeton about this time, and Mr. McLaurin has steadily worked productive properties there, yielding very high qualities.

In 1879, prices in England fell to a low point and many firms ceased to produce phosphate. But prices again recovering, renewed attention was given to this industry, and work on an enlarged scale being undertaken in Portland and Buckingham, the deposits in those regions proved to be more extensive than had been supposed. At the workings of the High Rock, Union, North Star, and Emerald Mines, phosphate has been found in large masses, and the reproach of uncertainty that was formerly attached to phosphate mining has been in a measure removed.

Pure specimens of Canadian apatite, according to Professor Chapman, yield 92.26 per cent. of phosphate of lime. The quality

of the produce of the mines depends largely upon the care taken in the separation of the apatite from other minerals that are often associated with it. The chief of these are pyroxene, mica and calcite. At the commencement of the industry, a shipment was made to England so badly selected as to be worthless. Instead of a remittance, the shipper was presented with a draft for freight and expenses, accompanied by a chemist's certificate saying: "There is dirt enough in England without importing any from across the Atlantic." The usual analysis obtained for cargo lots is 75 to 80 per cent., though it has run as high as 86 per cent., and has fallen below 70 per cent.

Owing to the abundance of surface shows, workings have not been carried to a great depth, 160 feet being the depth of the deepest pit that has been worked. The deposits are found to be persistent as far as traced, subject to the characteristic irregularities of this mineral. In Norway, large beds have been found at depths of 200 feet, and the similarity of the Canadian deposits has led to a prediction of favorable results from deep mining in Canada.

Prices in England for Canadian phosphate have varied from 1s. 3½d. for 70 per cent., with ½d. rise per unit, to 10d. without rise,—a difference for 80 per cent. phosphate of 50s. per ton. It was highest in 1877 and 1882, and lowest in 1879 and 1884.

The question of freights has been an important and often a perplexing one, which is now receiving a satisfactory solution by the removal of the deal-shipping trade from Quebec to Montreal and the use of steamers in place of sailing vessels. These steamers frequently require 300 to 500 tons of ballast to place under their deals and are glad to secure phosphate for this purpose, accepting from 5s. to 10s. per ton as freight, while sailing vessels have carried it for 2s. 6d. The low rates of grain freights have also proved favorable to the phosphate industry, and shipments have been made this season by the regular lines of steamers at 7s. 6d.

The increased output of our mines has encouraged large manufacturers to turn their attention to Canadian phosphate, and sales have been made to firms in Germany, who would not consider its use when small quantities were only available. A quality of 80 per cent. is usually required for that market.

An important question has been freely discussed as to the value of crude phosphates finely ground, when applied to the soil without treatment by acids. As the acid merely subdivides the particles, it is maintained that, if sufficiently pulverized by machinery, it will act effectively as a fertilizer. Experiments on the English coprolites and the Carolina phosphates tend to support this theory, but show that the effect is more gradual than with superphosphates. There is considerable doubt, however, as to the efficacy of Canadian phosphate in this way; but, should it be proved, an immense demand will arise, as farmers will feel more confidence in the use of a simple natural substance, and its great cheapness in this form will recommend its use. Mixed with barnyard manure it is thought to be effective.

The value of superphosphates has been stated by Mr. Lawes, who found that an acre of simple soil gave 2 tons 8 cwt. of turnip bulbs; but that with 5 cwt. of superphosphate of lime, the land being dug 6 inches deep, the yield was 8 tons 15 cwt., or fourfold.

The company that intends to make superphosphate here proposes to introduce its fertilizers among the Canadian farmers by giving them the article to use on half the field, upon condition that the extra-growth on that half shall be given to the company or the fertilizer shall be paid for. It is said that where this system has been tried the farmer invariably finds it to his interest to pay for the fertilizer and order a supply for the next season.

Although there are large tracts of lands with surface shows of apatite, the number of localities where these have opened into large deposits is limited. The vicinity of Lièvres River furnishes the locality of the largest discoveries, though in Templeton, Wakefield, North Burgess, and the region north of Kingston, the effect of working a number of the smaller seams has produced good results. The value of proved deposits of apatite has greatly increased; \$100 to \$200 per acre has often been paid, and, in one case, 100 acres have been purchased at the rate of \$1,250 per acre.

Experiments are being made to concentrate the phosphate from low grade ores, by separating the impurities; and as large quantities of such rock can be obtained cheaply, the result of such an invention will be of immense value. An enterprising shipper of phosphate is making the attempt to grind the rock here and ship

it in bags, thus securing better means of obtaining a correct analysis and constant freight opportunities.

The production of phosphate in Canada has increased, from 5,462 tons in 1877, to 17,500 tons in 1883, and will amount to about 22,000 tons in 1884.

XVII.

*POPULATION, IMMIGRATION, AND PAUPERISM IN
THE DOMINION OF CANADA.*

BY JOHN LOWE.

The facts bearing upon the first two divisions of my subject are sufficiently clearly defined in the records of the Department of Agriculture, which is also the Department of Statistics of the Dominion Government. Pauperism, however, as it is understood in the United Kingdom and among European nations, has, fortunately for Canada, no existence. I do not mean to say that we have no poor needing assistance. No considerable communities are without orphans, whose parents have left them without means of support; or old and infirm men and women, who have passed the period of life in which they can work for themselves, yet who have not succeeded in making provision from their savings for their declining years. But the proportion borne by these classes to the population is very small.

A detailed record of the main facts in regard to the population of Canada, from the earliest European settlement to the present time, may be found in the volumes of the Canadian census for the two decennial periods of 1871 and 1881, compiled under the careful and learned superintendence of Dr. Taché. I am indebted for notes on the population of Canada, which were used in this paper, to the able and pains-taking Historical Archivist of the Dominion of Canada, Mr. Douglas Brymner.

Under the French Régime, Canada was part of *La Nouvelle*

France, the larger title including Louisiana and other territories on the continent of America.

The Provinces composing the Dominion of Canada may be thus described :—

(1) **QUEBEC.** After the conquest by Great Britain (1759-60), ratified by treaty in 1763, Canada included the Province of Quebec and part of the Province of Ontario. This territory in 1791 was divided into the two Provinces of Upper and Lower Canada. Re-united in 1842, they were known as Canada West and East. At the confederation of the Dominion (1867) they were again divided into the Provinces of Quebec and Ontario.

(2) **ONTARIO** is thus co-extensive with the old Province of Upper Canada or Canada West.

(3) **NOVA SCOTIA** is the English name for part of *Acadie*, which included, speaking generally, the three Maritime Provinces, its territorial extent, however, shifting with the vicissitudes of warfare.

(4) **NEW BRUNSWICK**, at first a part of Nova Scotia, and subsequently called the County of Sunbury, was separated and constituted as a distinct Province in 1784.

(5) **PRINCE EDWARD ISLAND**, originally named St. John's Island, having been ceded by France in 1763, was separated into a distinct Province in 1770.

(6) **BRITISH COLUMBIA**, including Vancouver Island and the adjacent mainland, remained until a recent period under the rule of the Hudson's Bay Company.

(7) **THE NORTHWEST TERRITORIES**, covered by the charter of the Hudson's Bay Company, comprise Alberta, Assiniboia, Athabasca, Saskatchewan and Keewatin.

(8) **MANITOBA** was organized into a Province from these territories, immediately after their transfer to Canada.

These several Provinces and Territories are now united in the Dominion of Canada, which embraces all British North America, with the exception of the Island of Newfoundland. The area of the Dominion (not including Newfoundland), according to the census measurements, is 3,470,275 square miles, with a water area of about 140,000 square miles, making a total of over 3,610,000. The Dominion thus extends over the larger half of the Continent, —the area of the United States, without Alaska, being 2,933,598

square miles ; that of Alaska, 577,390 : making a total of 3,510,978. The extent of the territories of the Dominion of Canada, of the United States, and of the continent of Europe, is therefore nearly equal.

I. POPULATION.

The most convenient method of presenting the facts bearing upon the population of Canada, is to give a table of the several settlements and censuses from 1605 to 1881, with the authorities in each case, in reliance upon which the figures are given.

I think it is also advisable to add to this table a further statement of the populations and ratios of increase in certain districts of the United States, for the purpose of comparison with the provinces of the Dominion, for the reason that there has probably been no fact in our history more grossly misunderstood, not only among our own people, but also in the United States and in the United Kingdom, than the actual relative progress which has taken place in the provinces of Canada, as compared with similar progress in those of the United States having fairly corresponding positions.

I think that the New England States and their progress may fairly be compared with the Provinces of Quebec, New Brunswick and Nova Scotia ; while, proceeding further west, the prosperous State of Ohio would make a fair subject of comparison with the Province of Ontario. The fact will appear from the tables which I subjoin, that, when this selection is made, the comparisons are in favour of the Provinces and against the United States.

I think it should also be pointed out, when comparisons are made between the increases of the population of Canada and the very remarkable increases of that of the United States, that these last include the several annexations of Louisiana and Texas, and the subsequent cession of New Mexico and California, with their considerable populations,—the comparisons of increases being always made with the original population of the thirteen old states only.

The following is a tabulated statement of the records of the population of Canada from the earliest times, with the authorities :—

TABLE OF POPULATION OF THE PROVINCES, COMPOSING THE DOMINION OF CANADA, FROM
THE EARLIEST RECORDS IN 1605 TO THE CENSUS OF 1881.

LA NOUVELLE FRANCE.

YEAR.	ACADIE.	CANADA.	REMARKS AND AUTHORITIES.
1605	44	.....	Champlain.
1606	33	.....	Do.
1608	.....	28	Do.
1620	.....	60	Do.
1628	.....	76	Do.
1629	.....	117	Do. (90 of these English.)
1641	.....	240	Dollier.
1653	.....	2,000	Estimate in "Lettres Historiques."
1663	.....	2,500	Le Clerq.
1665	.....	3,215	Census.
1667	.....	3,918	Do.
1668	.....	6,282	Estimate.
1671	441	.....	Census.
1673	.....	6,705	Estimate.
1675	.....	7,832	Do.
1676	.....	8,415	Do.
1679	515	9,400	Acad.; Census, Can.
1680	.....	9,719	Estimate.
1681	.....	9,677	Census.
1683	.....	10,251	Estimate.
1685	.....	12,263	Census (1,538 of these Indians.)
1686	.....	12,373	Do., Acad.; Estimates, Can.
1688	885	11,562	Census.
1692	.....	12,431	Do.

Year	Population	Notes
1693	1,009	Census.
1695	13,639	Do.
1698	15,355	Do.
1701	1,134	Do. (N. part.)
1703	1,244	Do.
1706	16,417	Census.
1707	17,204	Estimate.
1712	18,440	Do.
1713	18,119	Do.
1714	18,964	Census (N. part.) Acad.; Estimate, Can.
1716	20,531	Estimate.
1718	22,983	Do.
1719	22,530	Census.
1720	24,434	Do.
1721	24,951	Do.
1722	25,053	Estimate.
1723	26,749	Do.
1724	26,710	Do.
1726	29,396	Do.
1727	30,613	Do.
1730	33,682	Do.
1731	35,164	N. part, Acad.; Estimate, Can.
1732	37,716	Estimate.
1734	39,063	Census.
1736	39,063	Estimate.
1737	39,970	Archives, Halifax; Estimate, Can.
1749	42,701	Do.
1752	55,009	Census.
1754	80,000	Do.
1755	82,000	Haliburton.
1758	82,000	Estimate.
1759	70,000	Conquest by English.
1760	70,000	Estimate.

TABLE OF POPULATION OF PROVINCES (Continued.)

Year.	ACADIE.			CANADA.		NORTHWEST TERRITORY.	REMARKS AND AUTHORITIES.
	NOVA SCOTIA.	P. E. I.		UPPER CANADA.	LOWER CANADA.		
1763	11,980	4,000					Archives, Halifax.
1764	12,998						Do. (not complete.)
1765	12,280	1,400					Do. (Acadians expatriated P.E.I.; Census Can.
1767	11,779	1,270					Archives (not complete); (Acadians expatriated P.E.I.)
1772	19,100						Estimate.
1775							Do.
1781	12,000 (British.)						Haliburton.
				UPPER CANADA.	LOWER CANADA.		
1784	32,000 (B.)			10,000	113,012		Do., U.E. Loyalists, Morse, N.B.; U.E. Loyalists, Upper Canada; Census, Lower Canada.
1790	30,000 (B.)				161,311		Haliburton, not including Cape Breton; Estimate, L. Can.
1793	11,000 (F.)						(Cape Breton only.)
1798	2,000						Estimate.
1806		4,500					Bouchette; Estimate.
1807		35,000		70,718	250,000		Estimate.
1811	65,000			77,000			Assessment Roll.

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TABLE OF POPULATION OF PROVINCES (Continued.)

Y EAR.	ACADIE.			CANADA.		NORTHWEST TERRITORY.		REMARKS AND AUTHORITIES.
	NOVA SCOTIA.	NEW BRUNSWICK.	P. E. I.	UPPER CANADA.	LOWER CANADA.		BRITISH COLUMBIA.	
1857	.....	.....	.....	.....	.....	139,000	.....	Estimate, Sir Geo. Simpson.
1861	330,857	252,047	80,857	1,396,041	1,111,566	.....	3,024	Census; Governor (B.C.)
								
								
								
1870	.....	.....	.....	.....	.....	.....	.....	Do., Man. (not including Indians); Govt. B.C.
								
1871	387,800	285,594	94,021	1,620,851	1,191,516	102,358	10,586	Census.
								
1881	440,572	327,233	108,891	1,923,228	1,359,027	65,954	49,459	Do.

It may be of interest in considering the facts contained in the above tables, to look at the relative percentages of increase between a number of the United States and the Provinces of the Dominion at different periods, and for this purpose the following tables have been compiled. They will be found to contain facts of great interest in relation to settlement and increase, both in Canada and in the United States which may be said to establish a continental rule or law: viz., that as population becomes dense, in the old States and the old Provinces, the rapidity of its increase is arrested, while in the new and unsettled, or at least partially settled Territories, it goes forward by leaps. Thus the Northwest Territory of Canada is beginning to exhibit the same phenomena as the Western United States have exhibited for the last quarter of a century.

COMPARATIVE GROWTH OF UNITED STATES AND CANADA.

(The calculations in the following tables are made from the next preceding date.)

STATES AND PROVINCES.	1790 POPULATION.	1800		RATE PER CENT.
		POPULATION.	INCREASE.	
Maine.....	96,520	151,719	55,199	57.
New Hampshire.....	141,899	183,762	41,863	29.
Massachusetts.....	378,717	423,245	44,528	12.
Rhode Island.....	68,825	69,122	297	0.4
Connecticut.....	238,141	251,002	12,861	5.
Vermont.....	85,416	154,465	69,049	81.
Ohio.....		45,365		
Illinois.....				
Michigan.....				
Quebec.....	161,311			
Nova Scotia.....				

STATES AND PROVINCES.	1810		RATE PER CENT.	1817		RATE PER CENT.
	POPULATION.	INCREASE.		POPULATION.	INCREASE.	
Maine.....	228,705	76,986	51.			
New Hampshire...	214,360	30,598	16.			
Massachusetts.....	472,040	48,795	11.			
Rhode Island.....	77,031	7,909	11.			
Connecticut.....	262,042	11,040	4.			
Vermont.....	217,713	63,248	41.			
Ohio.....	230,760	185,395	409.			
Illinois.....	12,282					
Michigan.....	4,762					
Quebec.....						
Nova Scotia.....				81,355		

STATES AND PROVINCES.	1820		RATE PER CENT.	1822		RATE PER CENT.
	POPULATION.	INCREASE.		POPULATION.	INCREASE.	
Maine.....	298,335	69,630	30.			
New Hampshire...	244,161	29,801	14.			
Massachusetts.....	523,287	51,247	11.			
Rhode Island.....	83,059	6,028	8.			
Connecticut.....	275,202	13,160	5.			
Vermont.....	235,764	18,051	8.			
Ohio.....	581,434	350,674	152.			
Illinois.....	55,211	42,929	349.			
Michigan.....	8,896	4,134	87.			
Quebec.....				427,465	266,154	165.
Nova Scotia.....						

the last quarter of a century.

STATES AND PROVINCES.	1824 POPULATION.	1830		RATE PER CENT.
		POPULATION.	INCREASE.	
Maine		399,455	101,120	34.
New Hampshire.....		269,328	25,167	10.
Massachusetts.....		610,408	87,121	16.
Rhode Island.....		97,199	14,140	17.
Connecticut.....		297,675	22,473	8.
Vermont.....		280,652	44,888	19.
Ohio.....		937,903	356,469	61.
Illinois.....		157,445	102,234	185.
Michigan.....		31,639	22,743	255.
Quebec.....				
Ontario.....	150,066			
Assiniboia (Man.).....				
New Brunswick.....	74,176			
Prince Edw. Island.....				

STATES AND PROVINCES.	1831		RATE PER CENT.	1834		RATE PER CENT.
	POPULATION.	INCREASE.		POPULATION.	INCREASE.	
Maine.....						
New Hampshire.....						
Massachusetts.....						
Rhode Island.....						
Connecticut.....						
Vermont.....						
Ohio.....						
Illinois.....						
Michigan.....						
Quebec.....	553,134	125,669	29.			
Ontario.....	236,702	86,636	57.			
Assiniboia (Man.).....						
New Brunswick.....				119,457	45,281	61.
Prince Edw. Island.....						

STATES AND PROVINCES.	1840		RATE PER CENT.	1841		RATE PER CENT.
	POPULATION.	INCREASE.		POPULATION.	INCREASE.	
Maine.....	501,793	102,338	26.			
New Hampshire.....	284,574	15,246	6.			
Massachusetts.....	737,699	127,291	21.			
Rhode Island.....	108,830	11,631	12.			
Connecticut.....	309,978	12,303	4.			
Vermont.....	291,948	11,296	4.			
Ohio.....	1,519,467	581,564	62.			
Illinois.....	476,183	318,738	202.			
Michigan.....	212,267	180,628	571.			
Quebec.....						
Ontario.....				455,688	218,986	92.
Assiniboia (Man.).....	805					
New Brunswick.....	156,162	36,705	30.			
Prince Edw. Island.....				47,042		

RATE PER CENT.	STATES AND PROVINCES.	1844		RATE PER CENT.
		POPULATION.	INCREASE.	
34.	Maine.....			
10.	New Hampshire.....			
16.	Massachusetts.....			
17.	Rhode Island.....			
8.	Connecticut.....			
19.	Vermont.....			
61.	Ohio.....			
185.	Illinois.....			
255.	Michigan.....			
	Quebec.....	697,084	143,950	26.
	Ontario.....			
	Nova Scotia.....			
	New Brunswick.....			
	Prince Edward Island.....			

RATE PER CENT.	STATES AND PROVINCES.	1850		RATE PER CENT.	1851		RATE PER CENT.
		POPULATION.	INCREASE.		POPULATION.	INCREASE.	
	Maine.....	583,169	81,376	16.			
	New Hampshire...	317,976	33,402	12.			
	Massachusetts.....	994,514	256,815	35.			
	Rhode Island.....	147,545	38,715	35.			
	Connecticut.....	370,792	60,814	19.			
	Vermont.....	314,120	22,172	7.			
	Ohio.....	1,980,329	460,862	30.			
	Illinois.....	851,470	75,287	79.			
	Michigan.....	397,654	185,387	88.			
	Quebec.....				890,261	193,197	28.
	Ontario.....				952,004	496,316	109.
	Nova Scotia.....				276,854	95,499	117.
	New Brunswick....				193,800	37,638	24.
	Prince Edw. Island.						

RATE PER CENT.	STATES AND PROVINCES.	1860		RATE PER CENT.	1861		RATE PER CENT.
		POPULATION.	INCREASE.		POPULATION.	INCREASE.	
	Maine.....	628,279	45,110	8.0			
	New Hampshire...	326,073	8,097	2.0			
	Massachusetts.....	1,231,066	236,552	24.0			
	Rhode Island.....	174,620	27,075	18.0			
	Connecticut.....	460,147	89,355	24.0			
	Vermont.....	315,098	978	.3			
	Ohio.....	2,339,511	359,182	18.0			
	Illinois.....	1,711,951	860,481	101.0			
	Michigan.....	749,113	351,459	88.0			
	Quebec.....				1,111,566	221,305	25.
	Ontario.....				1,396,091	444,087	46.
	Nova Scotia.....				330,857	54,003	19.
	New Brunswick....				252,047	58,247	30.
	Prince Edw. Island.						

STATES AND PROVINCES.	1870		RATE PER CENT.	1871		RATE PER CENT.
	POPULATION.	INCREASE.		POPULATION.	INCREASE.	
Maine.....	626,915	1,364	0·2	.....	.....	.....
New Hampshire...	318,300	7,773	2·	.....	.....	.....
Massachusetts....	1,457,351	226,285	18·	.....	.....	.....
Rhode Island.....	217,353	42,733	24·	.....	.....	.....
Connecticut.....	537,454	77,307	17·	.....	.....	.....
Vermont.....	330,551	15,453	5·	.....	.....	.....
Ohio.....	2,665,260	325,749	14·	.....	.....	.....
Illinois.....	2,539,891	827,940	48·	.....	.....	.....
Michigan.....	1,184,059	434,946	58·	.....	.....	.....
Quebec.....	.....	.....	.....	1,191,516	79,950	7·
Ontario.....	.....	.....	.....	1,620,851	224,760	16·
Nova Scotia.....	.....	.....	.....	387,800	56,943	17·
New Brunswick....	.....	.....	.....	285,594	33,547	13·
Manitoba.....	12,228	11,388	1,415·	.....	.....	.....
British Columbia..	10,586	.....	.....	.....	.....	.....

STATES AND PROVINCES.	1880		RATE PER CENT.	1881		RATE PER CENT.
	POPULATION.	INCREASE.		POPULATION.	INCREASE.	
Maine.....	648,936	22,021	4·	.....	.....	.....
New Hampshire...	346,991	28,691	9·	.....	.....	.....
Massachusetts....	1,783,085	325,734	22·	.....	.....	.....
Rhode Island.....	276,531	59,178	27·	.....	.....	.....
Connecticut.....	622,700	85,246	16·	.....	.....	.....
Vermont.....	332,286	1,735	0·5	.....	.....	.....
Ohio.....	3,198,062	532,802	20·	.....	.....	.....
Illinois.....	3,077,871	537,980	21·	.....	.....	.....
Michigan.....	1,636,937	452,878	38·	.....	.....	.....
Quebec.....	.....	.....	.....	1,359,027	167,511	14·
Ontario.....	.....	.....	.....	1,923,228	302,377	19·
Nova Scotia.....	.....	.....	.....	440,572	52,772	13·
New Brunswick....	.....	.....	.....	321,233	35,639	12·
Manitoba.....	.....	.....	.....	65,954	53,726	407·
British Columbia..	.....	.....	.....	49,459	38,873	367·

RECAPITULATION.

New England States.....	From 1850 to 1880 increased	47· percent.
The four Provinces—Ont.,		
Que., N. S., N. B.....	" 1851 " 1881	" 75· "
Ohio.....	" 1830 " 1880	" 241· "
Ontario.....	" 1831 " 1881	" 712· "
Massachusetts.....	" 1790 " 1880	" 371· "
Quebec....	" 1790 " 1881	" 743· "
Massachusetts.....	" 1830 " 1880	" 192· "
Quebec.....	" 1831 " 1881	" 146· "
Maine.....	" 1840 " 1880	" 29· "
Nova Scotia.....	" 1851 " 1881	" 59· "
New Brunswick.....	" 1851 " 1881	" 66· "

I may observe that in the selection of States and periods, for the purpose of this comparison, very great care has been taken to select such as would make as exact analogies as possible. The populations of the States given, are taken from the volumes of the United States' census, and those of the Provinces from the Canadian census. This comparison shows that the relative increase of the Canadian Provinces has not only been as rapid as that of the several States compared, but in many cases, much more rapid. The Province of Ontario, as I have already intimated, may be fairly compared with the State of Ohio; and Quebec and the Maritime Provinces, with the New England States.

If we take the population of Massachusetts, the largest and most prosperous of the New England States and the centre, so to speak, of their manufacturing industry, we have the fact that the rate of increase during the last census decenniad, was 18 per cent., while that of the old provinces of the Dominion, excluding the Northwest, was 18·07. This is, therefore, a most favourable showing, the comparison being with a state so pre-eminent, the manufacturing industries of which have attracted a considerable French Canadian immigration.

The cases of large increase of population in the United States which have outstripped all previously known facts, have occurred in the settlements on the Western prairies; but we have, even now, our beginnings of this kind of marvellous increase in the Province of Manitoba, as may be seen by the short table on page 208, which gives a comparison between Manitoba and the States of Colorado, Kansas, Dakota, Minnesota, and Illinois.

I subjoin also, on page 209, an abstract of the two censuses of Canada that have been taken since the Confederation of the Dominion, giving the Area, Population and Increase. They also show the division of the Population into Males and Females, from which it may be seen that the number of males preponderates.

The abstract that follows on pages 210 and 211 includes the Religions and Origins and Birth-places with the Increase of the People. On page 212, I subjoin a table of comparison of the Population of Cities and Towns having more than 500 inhabitants for the decennial period from 1871 to 1881.

POPULATION OF MANITOBA COMPARED WITH CERTAIN STATES OF THE UNION.

	YEAR 1856 FOR MANITOBA.		1870.	INCREASE.		YEAR 1881 FOR MANITOBA.		INCREASE.	
	1860.			Numerical.	Per Cent.	1860.		Numerical.	Per Cent.
Manitoba.	6,691		12,228	5,537	82	65,954		53,726	439
Colorado.	34,277		39,864	5,587	16	194,327		154,463	387
Dakota.	4,837		14,181	9,344	193	135,177		120,996	853
Kansas.	107,206		364,399	257,193	239	996,096		631,697	173
Minnesota.	172,023		439,706	267,683	155	780,773		341,067	77
Illinois.	1,711,951		2,539,891	827,940	48	3,077,871		537,980	21
	2,030,294		3,398,041	1,367,747	67	5,184,244		1,786,203	53

CENSUS OF CANADA—1871 AND 1881 COMPARED.

PROVINCES.	Area in Miles.	Persons—1871.	Persons—1881.	INCREASE.		1871.		1881.	
				Numerical.	Per Cent.	Males.	Females.	Males.	Females.
Prince Edward Island.	21.33	94,021	108,891	14,870	15.8	47,121	46,900	54,739	54,162
Nova Scotia.....	20,907	387,800	440,372	52,772	13.6	193,792	194,008	220,338	229,034
New Brunswick.....	27,174	285,394	321,233	35,639	12.5	145,888	139,706	164,119	157,114
Quebec.....	188,688	1,191,516	1,359,027	167,511	14.0	596,041	585,475	678,175	680,852
Ontario.....	101,733	1,620,851	1,923,228	302,377	18.6	828,390	792,261	976,470	946,758
Manitoba.....	123,200	18,995	65,954	46,959	247.2	9,750	9,245	37,207	28,747
British Columbia.....	341,305	36,247	49,459	13,212	36.4	20,532	15,715	29,503	19,956
The Territories.....	2,665,252	52,000	56,446	4,446	8.5			28,113	28,333
Total.....	3,470,392	3,687,024	4,324,810	637,786	17.3			2,188,854	2,135,956

PROPORTIONS.

PROVINCES.	PROPORTION PER CENT. TO EACH PROVINCE.		Persons to Sq. Mile.	Acres to a Person.	Acres of unoccupied land to a Person.	INSURANCE, MALES AND FEMALES.			
	Acres.	Persons.				Numerical.	Per Cent.	Numerical.	Per Cent.
Prince Edward Island.	.06	2.51	51.0	12.5	2.2	7,008	16.1	7,262	15.4
Nova Scotia.....	.60	10.18	21.0	30.3	18.1	26,746	13.8	26,026	13.4
New Brunswick.....	.78	7.42	11.8	54.1	42.2	18,231	12.5	17,408	12.4
Quebec.....	5.44	31.42	7.2	88.8	79.5	82,134	13.7	85,377	14.3
Ontario.....	2.93	44.47	18.9	33.8	23.8	147,880	17.8	154,497	19.5
Manitoba.....	3.55	1.52	.53	1,195.5	1,159.3	27,457	281.6	19,502	210.9
British Columbia.....	9.83	1.14	.14	4,456.9	4,469.5	8,971	43.7	4,241	26.9
The Territories.....	76.80	1.30	.02	30,219.3	30,213.7	.....	.....	.....	.....
Total.....	99.99	99.96	1.24	513.5	503.0				

NOTE.—The areas of the great waters, such as the great lakes of the Upper Provinces and the bays and arms of the seas in the Maritime Provinces may be estimated at 140,000 square miles.

RELIGIONS OF THE PEOPLE.

6

PROVINCES.	Baptists.	Catholics, (Roman).	Church of England.	Congre- gational.	Disciples.	Lutherans.	Meth'dists.	Presby- terians.	No Religion.	Other Denomi- nations.
Prince Edward Island....	6,236	47,115	7,192	20	594	4	13,485	33,835	14	396
Nova Scotia.....	83,761	117,487	60,255	3,506	1,826	5,639	50,811	112,488	121	4,678
New Brunswick.....	81,092	109,091	46,768	1,372	1,476	324	34,514	42,888	114	3,594
Quebec.....	8,853	1,170,718	68,797	5,244	121	1,003	39,221	50,287	432	14,351
Ontario.....	106,680	320,839	366,539	16,340	16,051	37,901	591,503	417,749	1,756	47,870
Manitoba.....	9,449	12,246	14,297	343	102	984	9,470	14,292	16	4,755
British Columbia.....	434	10,043	7,804	75	23	491	3,516	4,095	180	22,798
The Territories.....	20	4,443	3,166	.....	.....	4	461	531	1	47,820
Totals.....	296,325	1,791,982	574,818	26,900	20,193	40,350	742,981	676,165	2,634	146,202

ORIGINS OF THE PEOPLE.

PROVINCES.	African.	Chinese.	English and Welsh.	French.	German and Dutch.	Scandi- navian.	Indian.	Irish.	Swiss.	Scotch.	People of other Origins.
Prince Edward Island	155	.....	21,568	10,751	1,368	38	281	25,415	1	48,933	381
Nova Scotia.....	7,062	.....	131,383	40,141	42,101	735	2,125	66,067	1,860	146,027	3,071
New Brunswick.....	1,638	.....	94,861	56,635	10,683	932	1,401	101,284	41	49,829	3,929
Quebec.....	141	7	81,866	1,075,130	8,409	648	7,515	123,749	254	54,923	6,385
Ontario.....	12,097	22	542,232	102,743	210,557	1,578	15,325	627,262	2,382	378,536	30,494
Manitoba.....	25	4	11,900	9,949	8,804	1,023	6,767	10,173	10	16,506	733
British Columbia.....	274	4,350	7,596	916	952	236	25,661	3,172	40	3,892	2,370
The Territories.....	2	.....	1,375	2,896	32	33	49,472	281	.....	1,217	1,138
Totals.....	21,394	4,383	892,841	1,299,161	282,906	5,223	108,547	957,403	4,588	699,863	48,501

Totals	21,394	4,383	892,841	1,299,161	282,906	5,223	108,547	957,403	4,588	699,863	48,501
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LOWE ON POPULATION.

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BIRTH PLACES OF THE PEOPLE.

PROVINCES.	British Isles and Possessions	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	British Columbia.	Territories.	United States.	Other Foreign Countries.
Prince Edward Island	8,814	95,234	2,507	1,346	177	105	.....	.....	.....	609	99
Nova Scotia.....	23,836	1,639	405,687	4,482	441	332	.....	6	1	3,004	1,140
New Brunswick	25,133	2,719	6,160	277,643	3,127	310	.....	3	2	5,108	1,027
Quebec	52,015	586	813	1,272	1,269,975	10,379	33	19	48	19,415	5,372
Ontario	353,904	686	3,706	2,801	50,407	1,435,647	62	42	158	45,454	30,361
Manitoba	8,233	154	820	341	4,085	19,125	18,020	25	6,422	1,752	6,977
British Columbia....	5,994	23	379	374	396	1,572	24	32,175	14	2,295	6,213
The Territories	303	6	16	6	101	517	1,450	5	51,785	116	2,141
Totals	478,235	101,047	420,088	288,265	1,327,809	1,467,988	19,590	32,375	58,430	77,753	53,330

INCREASE PER CENT. IN POPULATION.

Leaving out the estimate of the Territories for 1871, the whole Dominion has increased in population 18.7 (nearly) per cent.

The four Provinces which first formed the Dominion—viz., Ontario, Quebec, Nova Scotia and New Brunswick—have increased during the decenniad 16 per cent.

The increase for the same Provinces in 1871 over 1861 was 12.8 per cent.

The census of Canada, the same as that of the United States, is taken on the system known as *de jure* or *de droit*, as being the best adapted to the circumstances of the Provinces of a Confederation and Territories of very wide extent, in which portions are necessarily very sparsely settled. The entries are made by sworn enumerators, who go from house to house,—the system of leaving schedules to be filled up by individuals, the subjects of the information, not being adapted to the circumstances of the population. The last census was taken with reference to the 1st day of April, 1881, and includes a variety of statistical information besides the simple enumeration of population. The census of the Dominion is taken decennially.

POPULATION OF CITIES AND TOWNS HAVING OVER FIVE
THOUSAND INHABITANTS COMPARED.

NAMES.	PROVINCES.	POPULATION.		Numerical increase or decrease.	Per- centage.
		1871.	1881.		
Montreal	Quebec	107,225	140,747	33,522	31.21
Toronto	Ontario	56,092	86,415	30,323	54.05
Quebec	Quebec	59,699	62,446	2,747	4.60
Halifax	Nova Scotia...	29,582	36,100	6,518	22.03
Hamilton	Ontario	26,716	35,961	9,245	34.60
Ottawa	Ontario	21,545	27,412	5,867	27.23
St. John	New Brunsw'k	28,805	26,127	*2,678	*9.29
London	Ontario	15,826	19,746	3,920	24.76
Portland	New Brunsw'k	12,520	15,226	2,706	21.61
Kingston	Ontario	12,407	14,091	1,684	13.57
Charlottetown	P. E. Island..	8,807	11,485	2,678	30.40
Guelph	Ontario	6,878	9,890	3,012	43.79
St. Catharines	Ontario	7,864	9,631	1,767	22.46
Brantford	Ontario	8,107	9,616	1,509	18.61
Belleville	Ontario	7,305	9,516	2,211	30.26
Trois Rivières	Quebec	7,570	8,670	1,100	14.53
St. Thomas	Ontario	2,197	8,367	6,170	280.83
Stratford	Ontario	4,313	8,239	3,926	91.02
Winnipeg	Manitoba	241	7,985	7,744	213.27
Chatham	Ontario	5,873	7,873	2,000	34.05
Brockville	Ontario	5,102	7,609	2,507	49.13
Levis	Quebec	6,691	7,597	906	13.54
Sherbrooke	Quebec	4,432	7,227	2,795	63.06
Hull	Quebec	**	6,890	.....	.....
Peterborough	Ontario	4,611	6,812	2,201	47.73
Windsor	Ontario	4,253	6,561	2,308	54.26
St. Henri	Quebec	**	6,415	.....	.....
Fredericton	New Brunsw'k	6,006	6,218	212	3.49
Victoria	Brit. Columbia	3,270	5,925	2,655	81.19
St. J. Baptiste (village)	Quebec	4,408	5,874	1,466	33.25
Sorel	Quebec	5,636	5,791	155	2.75
Port Hope	Ontario	5,114	5,585	471	9.21
Woodstock	Ontario	3,982	5,373	1,391	34.93
St. Hyacinthe	Quebec	3,746	5,321	1,575	42.04
Galt	Ontario	3,827	5,187	1,360	35.53
Lindsay	Ontario	4,049	5,080	1,031	25.46
Moncton	New Brunsw'k	**	5,032	.....	.....
Totals .....	.....	494,699	641,703	147,004	29.71

* The indicated decrease of the population of the city of St. John is attributable to the great fire which occurred in the year 1877, when half of the city was laid in ashes. Great numbers were thereby driven into the surrounding districts, and many, whose business and social ties were thus severed, did not return to the city.

** The limits of the city of Hull and the towns of St. Henri and Moncton not having been defined in 1871, no comparison can be made. Leaving out the above city and towns, the total increase and rate per cent. are as represented in the table.

NOTE.—In 1871 there were in Canada twenty cities and towns of 5,000 inhabitants and over, with a total population of 430,043. In 1881 the number of such cities and towns had increased to thirty-seven, having a total population of 660,040.

II. IMMIGRATION.

The Europeans who have come to Canada within a few generations, and their descendants, may in the largest sense, be termed the Immigration to Canada. The numbers and times of arrival of those who came in our earliest history are unfortunately not matters of exact record, and the regular registration of arrivals at Quebec commenced at a comparatively recent date. The records of the population, however, fairly indicate the periods and the volume of the distinctive early immigrations. The features of the several great immigrations to Canada, and the motives which induced them, are very clearly defined and have made a very distinct impression upon the character of the present population.

The first movement in point of time was that of the French immigration. Its motive was two-fold: first, the spread of the Christian Religion among the Indians, or, as they were called, the Savages of Canada; and secondly, Commercial Adventure.

The first settlement took place in the Province of Acadie, now Nova Scotia, in 1605. It commenced with *hope*, which was, unfortunately, soon to give place to the reality of disaster. The first French colonists numbered not more than forty-four, and being ignorant of the rigour of the climate were totally unprepared for a North American winter. They consequently suffered severely and lost a quarter of their number. The cruel misfortunes which befel these first colonists in Acadie appear to have had a deterrent effect on further settlement for nearly half a century. We find from the census taken in 1671, that the population was then only 441.

In Quebec, the first French settlement was made in 1608, three years after that in Acadie, the numbers at first being very small, and only increasing very slowly for over forty years, when the population took a leap from 240 in 1641, to 2,000 in 1653. From this period, there appears to have been a gradual and rapid augmentation of population from immigration and natural increase, very little broken by leaps and bounds till the time of the Conquest by the English in 1759, when the population was estimated to be 82,000.

It is to be remarked that, from the time of the Conquest, im-

migration to Canada from France may be said to have nearly ceased, the numbers which came afterwards not being of a nature to affect the volume of the population. But the increase of the French speaking population in Canada, under British rule from that period, is one of the most noticeable and clearly marked facts in the natural history of mankind. The population of French origin, in the Dominion, is stated in the census of 1881 at 1,298,929; and in addition there has been a French Canadian emigration to the United States of from 300,000 to 500,000,—certainly a large aggregate to have sprung from the first few settlers on the banks of the St. Lawrence and in Acadie. This fact affords a remarkable proof of extremely favourable conditions of life; and of the prosperity, enjoyed by the French Canadians under the parish system, which has been a prominent feature in their social life from the first settlement, and which was in fact guaranteed at the Conquest.

The next large and clearly marked immigration was that of the U. E. Loyalists, from the thirteen revolted colonies to the Maritime Provinces, chiefly New Brunswick; to the Eastern Townships of Quebec; and to the great Province of Ontario, of which they formed the nucleus of the population in as marked a manner as did the French settlers in the Province of Quebec.

There does not appear to have been any exact record of the statistics of this movement; but, according to an estimate of Governor Parr in a despatch to the Imperial Government, the total numbers of those who arrived in Nova Scotia and New Brunswick were, in 1784, 20,000. They continued to arrive in small bodies for several years after.

The numbers of those who came to the Province of Quebec in the same year (1784) according to the careful compilation of Dr. Taché accompanying the first census of the Dominion (1871) was 10,000; and Dr. Ryerson, in his account of the U. E. Loyalists, states that there was an actual count made of 10,000 who settled in Ontario, in 1783 and 1784, and to these were added accessions more or less numerous for several years. In round numbers, therefore, more than 40,000 U. E. Loyalists settled in Canada during the years immediately following the Treaty of Versailles in 1783.

The three main immigrations to Canada are, therefore, the

French, the U. E. Loyalists, and that from the United Kingdom, and they have been of such a nature as to plant the roots in Canadian soil of a distinctively separate political system or existence from that of the Republic of the United States on our southern frontier; and furthermore, these roots have, for the future, the larger half of the Continent in which to grow.

It is to be remarked, in considering this point of the nature of the population planted by these first and main immigrations, that, in view of the more rapid and early development of the agricultural, industrial, and commercial resources of the United States in the past, those early prosperous fields have been considered by many to be more favourable for settlement than Canada, and have had in consequence a larger immigration, although a comparison of the figures of immigration undoubtedly shows that now the balance of advantage of this nature is being very rapidly redressed. The desire to better the conditions of life has been the cause of immigration alike into Canada and the United States. But, while those who have felt sympathy with the Republican institutions have settled in the States, sympathies in favour of British institutions and the British flag have led to the Canadian immigration. It has thus happened that the frontier line has to a large extent operated as a political sieve,—the result being shown in what may be called the national sentiment of the people of Canada to-day. It was remarked by the first Napoleon, as reported by Las Cases in the "*Mémorial de Sainte-Hélène*," that while there is nothing more intangible or difficult to describe and define than this kind of sentiment, yet there was nothing which he had found so difficult to meet and overcome.

It will appear on reference to the statistical tables that there was a large and steady increase of population in the Province of Quebec, over any possible natural increase, from the time of the U. E. Loyalist immigration to 1822. From that period to the present moment there does not appear to have been any large immigration in any one year, but a small, steady increase over the natural increase of the population.

In Ontario, from the date of the U. E. Loyalist settlement, the increase of population to 1841, was exceedingly rapid. The census taken in that year gives the population as 455,688,

showing an average yearly increase during this period of more than 7,800, thus proving a very large increase by immigration. Again from the date of the Union (1841), to that of the first census after Confederation (1871), the average annual increase of the population of Ontario was 38,838, again proving a large immigration.

In New Brunswick, from the date of the U. E. Loyalist settlement to the time of the first census in 1824, the population increased from 11,235 to 74,176. In the next sixteen years (to 1841) the census returns show an increase of 81,986, or 5,124 annually,—an increase that must have been largely due to immigration. Since that period, the annual increase has been less, showing a less rapid influx of immigration into the Province.

The population of Nova Scotia in 1784 is given as 42,347 of British origin, besides the French Acadians, estimated by Dr. Taché to have numbered about 14,000. The first complete census of the Province was not taken until 1817, when the number of inhabitants was found to be 81,351. In the next ten years to 1827, the population had increased by one-third; but the immigration in the next decenniad must have been still larger, the increase of population having been more than 7,000 a year, or five eighths in eleven years. The immigration after this date does not seem to have been marked by the same degree of increase, the figures showing the population to have doubled in about forty years, and at the date of the last census (1881) it was 440,572.

The first census of Prince Edward Island was taken in 1798, when the total population was 4,372. No accurate return of the population was again obtained until 1841, when another census gave the number of inhabitants as 47,042. Since that time there does not seem to have been any large immigration,—the population at the first census taken after Confederation (1871) thirty years later, being 94,021, i.e., not quite double.

We come next to the period when the actual figures of immigration began to be taken. The first records I find of immigrant arrivals by the St. Lawrence route at the port of Quebec were between the years 1819 and 1825. The numbers recorded are large for the population and the facilities of transport then existing; and it appears from the published details that, even at that

early period, the St. Lawrence route was used as offering facilities to passengers destined for the Western United States. The following is a tabular statement of the arrivals :—

1819.....	12,907
1820.....	11,239
1821.....	8,050
1822.....	10,468
1823.....	10,258
1824.....	6,515
1825.....	9,097

Of these it was estimated, as appears from the records of the time, that one third settled in Quebec, one third in Ontario, and that one third were passengers to the United States. This division, however, into equal thirds, could have been only a very rough approximation.

We now come to the records kept by the Quebec Immigration Agency of the Government, which begin with the year 1829 and continue to the present date; they will be found on page 218.

This table is interesting as containing an exact record of immigrant arrivals by the St. Lawrence for a period of fifty-five years. We must, however, remark with respect to it, that the numbers given were not all settlers in Canada, large numbers of immigrants from Europe to the United States, especially those from Germany and Norway, having used the St. Lawrence route, on account of the facilities it afforded. Neither is it, on the other hand, a record of the total immigration to Canada in the period named, since many immigrants came in at the ports of the Maritime Provinces, while others again came by the United States ports of Boston, Portland, New York, Baltimore, etc.

There are no means of determining with accuracy the numbers of Canadian immigrants in the following table by the St. Lawrence route, nor the exact number of passengers for the United States. This separation has, however, been attempted from the year 1866. It is based upon the reports of the agents of the Department of Agriculture, who have taken the declarations of immigrants with respect to their intention of settling in Canada. The table will be found on page 219.

I have no doubt of the carefulness with which this work has been done; and therefore of the approximate accuracy of the statement. There are, however, no means of keeping any record

TABLE OF IMMIGRATION AT THE PORT OF QUEBEC.

Years.	England.	Ireland.	Scotland.	Germany and Norway.	Other Countries.	Total.
1829 to 1833.	43,386	102,266	20,143	15	1,889	167,699
1834 " 1838.	28,561	54,904	11,061	485	1,346	96,357
1839 " 1843.	30,791	71,981	16,311	.....	1,777	123,860
1844 " 1848.	60,458	112,192	12,767	9,728	1,219	196,364
1849....	8,980	23,126	4,984	436	968	38,494
1850....	9,887	17,976	2,879	849	701	32,292
1851....	9,677	22,381	7,042	870	1,106	41,076
1852....	9,279	15,983	5,477	7,256	1,184	39,176
1853....	9,585	14,417	4,745	7,456	496	36,699
1854....	18,175	16,165	6,446	11,537	857	53,180
1855....	6,754	4,106	4,859	4,864	691	21,274
1856....	10,353	1,688	2,794	7,343	261	22,439
1857....	15,471	2,016	3,218	11,368	24	32,097
1858....	6,441	1,153	1,424	3,578	214	12,810
1859....	6,481	417	793	2,722	.....	8,778
1860....	4,846	376	979	2,314	.....	10,150
1861....	7,780	413	1,112	10,618	.....	19,923
1862....	6,877	4,545	2,979	7,728	47	22,176
1863....	6,317	4,949	3,959	4,182	12	19,419
1864....	5,013	3,767	2,914	7,453	.....	19,147
1865....	9,296	4,682	2,601	4,770	6	21,355
1866....	7,235	2,230	2,222	16,958	3	28,648
1867....	9,509	2,997	1,793	16,453	5	30,757
1868....	16,173	2,585	1,924	13,607	11	34,300
1869....	27,876	2,743	2,867	9,626	2	43,114
1870....	27,183	2,534	5,356	9,396	6	44,457
1871....	23,710	2,893	4,984	5,391	42	37,020
1872....	21,712	3,274	5,022	4,414	321	34,743
1873....	25,129	4,236	4,803	2,010	723	36,901
1874....	17,631	2,503	2,491	857	412	23,894
1875....	12,456	1,252	1,768	.....	562	16,038
1876....	7,720	688	2,131	.....	362	10,901
1877....	5,927	663	829	.....	324	7,743
1878....	7,500	913	1,425	.....	457	10,295
1879....	14,113	1,088	1,602	.....	448	17,251
1880....	18,647	2,485	2,845	.....	1,020	24,997
1881....	24,426	2,480	2,861	.....	471	30,238
1882....	33,650	5,992	4,476	.....	732	44,850
1883....	29,003	10,638	5,460	.....	865	45,966
	644,005	534,697	174,346	184,284	19,564	1,556,896

Yearly average, 28,307.

of the further movements of these immigrant arrivals which, with the facility afforded by a long line of frontier, and the contiguous territory of the United States, have been affected by the fluctuations of the demands for labour and rates of wages, and also by the attractions of the opening up of new lands for settlement. There has been, from this cause, a considerable movement from time to time, from both sides of the frontier line.

YEARS.	Immigrant Passengers for United States.	Immigrant Settlers in Canada.
1866	41,704	10,091
1867	47,212	14,666
1868	58,683	12,765
1869	57,202	18,630
1870	44,313	24,706
1871	37,949	27,773
1872	52,608	36,578
1873	49,059	50,050
1874	40,649	39,373
1875	9,214	27,382
1876	10,916	25,633
1877	5,640	27,082
1878	11,226	29,807
1879	20,560	40,492
1880	47,112	38,505
1881	69,025	47,991
1882	80,692	112,458
1883	72,274	133,624

In order to show the manner in which the figures in the above table are made up, I have subjoined, on page 220, a statement from the Report of the Minister of Agriculture, giving the number of immigrant settlers at different points in the Dominion for the years named.

The immigration to Canada, since the special great immigrations to which we have referred, has been mainly from the United Kingdom. The figures, however, are now beginning to show a considerable percentage of Germans and Scandinavians, and there have been three special immigrations within the last ten years of Mennonites, Icelanders, and Russian Jews.

The Icelanders who came in 1875 to the number of 285 were followed by others, and in 1877 numbered 1,500. At first they suffered hardships in a special colony on the west shore of

	1877.	1878.	1879.	1880.	1881.	1882.	1883.
At Quebec.....	4,201	5,804	11,017	14,359	15,614	31,032	36,084
Suspension Bridge.....	6,453	7,022	7,565	5,770	5,466	7,217	7,217
Halifax, N.S.....	930	1,970	3,430	2,265	948	1,431	7,484
St. John, N.B.....	141	276	.....	90	36	564	29
Portland, Me.....	1,513	161	.....	124	348	4,369	4,455
Montreal, via Boston and New York.....	.....	.....	.....	.....	.....	8,424	.....
*Manitoba and Northwest, settlers entering at ports other than those above enumerated, and other than those from the old Provinces, viz.:—Emerson (12,119), Grt-na (1,879), via Port Arthur (3,415), and Duluth (2,200), and across frontier from Grt-na to Benton (1,406).....	2,084	3,139	7,905	4,936	3,757	14,525	21,019
British Columbia.....	.....	.....	.....	.....	.....	12,862	9,000
<i>From United States.</i>							
At Algoma.....	.....	.....	.....	.....	.....	.....	6,185
Coaticooke.....	.....	.....	.....	.....	.....	900	470
Ottawa.....	.....	.....	.....	.....	291	215	.....
Toronto.....	.....	.....	.....	.....	171	1,269	1,538
Kingston.....	.....	.....	.....	.....	56	70	.....
London.....	.....	.....	.....	.....	185	464	876
Prescott.....	.....	.....	.....	.....	.....	.....	4,250
North of Lake Superior.....	.....	.....	.....	.....	.....	.....	.....
Reported with settlers' goods by Custom Houses.....	15,322	18,372	30,717	27,544	32,587	81,004	98,637
	11,759	11,435	9,775	10,961	15,404	30,554	34,987
Total Settlers.....	27,082	29,807	40,492	38,505	47,991	112,458	133,624

*The total immigration into Manitoba and the Northwest in 1883 was about 51,244, ascertained as follows:—Reported at Emerson, 44,223: along the frontier, 1,406. The nationalities were:—from Europe, 8,339; Canada, 25,301; United States, 13,998. From the total, 51,244, apart from the 1,406 deduct 17 per cent. for floating population (8,472), making total settlers 42,772.

Lake Winnipeg, but they have since mingled more generally with the population around them, becoming successful settlers, and attracting year by year fresh accessions of their countrymen, with a well marked prospect of continued increase. They number now about 2,500.

The German Mennonites who emigrated to Canada from the north shore of the Sea of Azov in Southern Russia, because of restrictions upon their liberties arising from military regulations and educational laws, numbered in 1874, 1,532; in 1875, 3,285; and three years later, 6,394. These people have found in Canada the freedom they desired. They are thrifty and industrious, and are rapidly increasing.

The Russian Jews numbered 1,375 and came in 1882. A large proportion of these were at first unsuccessful as settlers, apparently from having acquired habits of trading rather than agricultural industry, but they have now been placed on lands in the Qu'Appelle valley by their more wealthy brethren, and the reports since received of them are favourable.

It is to be observed that the immigrants who come to settle in Canada from the United Kingdom or parts of the Continent of Europe bring with them the skill and education as well as the habits, which they have acquired at home, together with very considerable means, the average of which per head is found to be about \$60. People who emigrate voluntarily with the motive of bettering their condition have naturally more than the average of energy. It follows that immigrant settlement in Canada is, to a large extent, what may be called a natural selection of energy, and one effect of this is seen in the force of character which is developed by the people.

It is found that successful immigrants are a source of great wealth to the country, in that they immediately become producers and also consumers of dutiable goods,—thus at once contributing to the wealth of the country by their production and to its commerce and internal industry by their consumption, as well as directly to the revenue in duties. An ordinarily successful immigrant family would earn and spend from \$400 to \$600 a year. \$500 would not be an excessive average. Such families would thus be each contributors of from \$50 to \$60 per annum to the revenue. An immigration, therefore, of 10,000 of such

133,624
112,458
47,991
38,505
40,492
29,807
27,082
.....
Total Settlers
244,
The
72),

families in one year would mean a very large accession to the whole wealth of the community. It has not been found that either poverty or large families are any hindrances to the success of the immigrant. Where there are ability and willingness to work, a large family, so far from being a weakness or a burden, is a source of strength.

It was remarked by Buckle that, in the earlier migrations of mankind, settlement generally took place along the banks of rivers which afforded means of communication; and the same fact is to be noticed in the first settlements in America. But the steel rail has taken the place of the navigable rivers, opening up communications and promoting settlement over vast areas on this continent, that would otherwise remain uninhabited, at least in so far as relates to Europeans or their descendants. We have seen striking examples within the last twenty years in the great civilizations that have suddenly sprung up on the Western and South-western prairies of the United States.

A similar policy is now being pursued in the Canadian Northwest, and similar results are rapidly following. Within one year, or eighteen months from this date, there is reason to believe that there will be transcontinental railway communication within the Dominion of Canada from the Atlantic to the Pacific Ocean. The construction of this great line has, so far, been prosecuted with an energy hitherto unequalled in the railway construction of the world, and a territory as large as Europe from the latitude of Paris to the extreme north, having almost illimitable resources, agricultural, industrial and commercial, to be developed, is now being opened up for settlement.

The Government of Canada, in its care to foster immigration, has established effective immigration agencies at the principal seaports, and also at important points in the interior, at Quebec, Halifax, St. John, N.B., and Victoria, B.C., as well as at Sherbrooke, Montreal, Ottawa, Kingston, Toronto, Hamilton, London, Ont., Port Arthur, Emerson, Winnipeg, Brandon, Qu'Appelle, Medicine Hat, and Calgary. All possible assistance and direction are afforded to the immigrant at these Government agencies and settlement is thereby facilitated. The sick are cared for, and the absolutely indigent temporarily assisted; care, however, is taken to prevent, as far as possible, any pauperization of the recipients.

III. PAUPERISM.

There is little to be said about the third division of my subject. Pauperism, as already stated, in the sense in which the term is used in the United Kingdom and other parts of Europe, is without significance among us. We have no paupers in Canada: no class of people unable to earn their own subsistence and supported by taxes imposed by the State. There is, of course, a certain proportion of infirm persons and persons from whatever cause, unable to work among us, but this proportion is very small, and they are mainly supported by relatives and friends.

There are many charitable institutions such as Hospitals, Orphanages, Lunatic and various other Asylums, Houses of Industry, etc., supported by voluntary contributions, by properties which they possess, and by grants from the Provincial Legislatures. The total number of inmates of such institutions in the whole Dominion is given in the census enumerations of 1871 and 1881. The enumerations include the servants and attendants, in many institutions forming a considerable portion of the whole, and from these figures can be gathered the relative proportion to the total population at the two periods:—

KINDS OF INSTITUTIONS.	1871.		1881.	
	No. of Institutions.	No. of Inmates.	No. of Institutions.	No. of Inmates.
Hospitals.....	38	1,816	83	5,118
Orphanages.....	23	1,317	46	2,770
Lunatic Asylums.....	7	2,823	13	4,655
Various Asylums, Charitable } Industrial Houses..... }	80	4,305	85	4,431
TOTALS.....	148	10,321	227	16,974

The figures for 1871 refer to the four Provinces of Ontario, Quebec, New Brunswick, and Nova Scotia; while those for 1881 include as well Prince Edward Island, British Columbia, Manitoba, and the Northwest Territories.

The number of the inmates of these several institutions in 1871, including all servants and attendants, had a relation to the whole population of nearly three tenths of one per cent., and in 1881, of nearly four tenths. A large part of the inmates of the Hospitals and Asylums pay for their board as well as for their medical and other attendance. In the Industrial Houses many of the inmates earn a large proportion of the whole cost of keeping them; and the inmates of Orphanages are placed in situations as soon as they become of age. If, therefore, we had any means of ascertaining the numbers of those who live simply on eleemosynary aid in the institutions referred to in the above table, they would be found to form a much more insignificant fraction of the whole population than that above stated.

In addition to these classes of institutions, there are national societies, such as St. George's, St. Andrew's, St. Patrick's, Irish Benevolent, St. Jean Baptiste, etc., which afford temporary aid to distressed persons of their several nationalities, and fill a very useful place in the cities where they exist. Such institutions are entirely supported by voluntary contributions. The absolute amount of aid afforded by them, however, measured by money value, is very small, having in view the extent of the population and the wealth of the communities in which they exist. Each society keeps its own accounts; and there are no general accounts of the total expenditure. It is further to be observed that, although the operations of these societies are charitable, they cannot be properly classed as pertaining to pauperism.

The very general distribution of wealth in the Dominion; the almost universal extent to which the cultivators of the soil are owners and masters of their acres; the generally high rate of wages paid to the working classes, both artisans and labourers; and the relative cheapness of living;—all these influences are happily inimical to the existence of pauperism in any large degree in Canada.

XVIII.

*THE BANKING SYSTEM OF CANADA.**

BY GEORGE HAGUE.

So far as that can be called a system which presents very varied aspects to the bystander, the banking system of Canada is characterized, partly by what is common to the banks of the United Kingdom, and partly by methods which have been adopted from the United States. It may be said that the banks of Canada reflect to a singular degree the original circumstances of the various classes that compose the population of the Dominion. Unlike the banking establishments of Australia and other British Colonies, nearly all the banks of Canada have their centre and root in the country itself. In only two instances have we establishments with their governing bodies in London.

Of the forty-three banks now doing business in Canada, fourteen have their headquarters in the Province of Quebec, twelve in the Province of Ontario, nine in Nova Scotia, four in New Brunswick, three in Prince Edward Island, and one in British Columbia. These banks are all joint-stock companies; for although a considerable number of so-called private bankers may be found in Canada, these are by no means of the same character as the private banking firms in Great Britain, that for so long have carried on business on terms of equality with the

* Paper condensed from the address as originally delivered.

joint-stock banks. We have nothing, in short, to correspond to such firms as the Glyn's, Barclays, and Smiths, of London; the Gurneys of Norfolk; the Birkbecks and Becketts, of Yorkshire, and other noted firms of the same character in various English counties.

I. GENERAL ORGANIZATION.

All the joint-stock banks of the Dominion, with one or two exceptions, carry on business under a general banking law. Formerly each bank had a separate charter, and such charters differed in their provisions. At the present moment, although a joint-stock bank cannot be set on foot without a special charter, all charters are subject to the provisions of a law covering the whole ground of the rights, powers, and responsibilities of the shareholders, directors, and the corporation generally, and limited in its operation to a period of ten years. The whole question of banking, including the important one of the currency of the country, comes up for discussion in Parliament at decennial periods. Moreover by the act establishing Confederation, the subject of banking is reserved for Federal, as distinct from Provincial, jurisdiction.

The larger banks of the Dominion have an organization almost identical with that of the great banks of Scotland, from which most of the traditions and modes of banking amongst us were drawn. Several of these have capital in excess of any similar institutions in the United States, and from this point of view, one of them, the Bank of Montreal, ranks as one of the largest in the world. Its paid-up capital amounts to \$12,000,000, and it has, in addition, a reserved fund of half as much more. The larger institutions have branches in nearly every part of Canada, besides carrying on business both in the United States and Great Britain.

There is, perhaps, no field in which the energy and enterprise, that have won for Canada, in spite of difficulties, her high place upon the continent of America, have been displayed more markedly than in that of banking. Canadians have just reason to be proud of the fact, that, in a region so far north that it was once utterly despised, not only by its nearest neighbours,

but its original possessors, they have succeeded in developing territory which, not in extent alone, will bear comparison with the best districts of the United States. Similarly, it is our boast to have built up a banking system which has proved, despite those defects from which no human organizations are free, to be thoroughly adapted to the expanding circumstances of the country. As the commerce of Canada is intimately connected with Great Britain and the United States, these banks have been able to plant themselves firmly in the great financial centres, both of the old world and the new, and to secure a position in many respects unique. The standing and strength of the Canadian banks have often proved of the highest service to the commercial communities of New York and Chicago, and the credit and resources at their command are fully appreciated by those who have large transactions in these centres, and carry on business with foreign countries.

I have said that the larger banks were formed upon a Scotch model. They have their headquarters in the great commercial cities. Their founders were British by birth, training, or antecedents, belonging to the great fraternity of commercial pioneers who swarmed out from Glasgow, Liverpool, and other British cities. I name these as distinct from that other and more numerous class of agricultural settlers who, by toilsome and continuous labour, have turned a wilderness of forest, once absolutely valueless, into a productive country worth hundreds of millions. Both of these classes have been *collaborateurs* to one great end. The banks have followed the progress of settlement, and have grown with the expansion of the country. Branches of the Bank of Montreal have been opened from Halifax on the Atlantic Ocean, to Winnipeg in the centre of the continent; while the Bank of British North America extends across the continent from New Brunswick on the Atlantic, to British Columbia on the Pacific. Of the larger banks, the Bank of Montreal has a capital of \$12,000,000 with thirty branches; the Bank of Commerce, with its headquarters in Toronto, has a capital of \$6,000,000 and thirty-four branches; the Merchants Bank of Canada, with its headquarters in Montreal, a capital of \$5,800,000 and thirty branches; the Bank of British North America, a capital of £1,000,000 sterling, or \$4,866,000, and sixteen

branches. Each of these has an office in New York, and three of them offices in Chicago and London. The Bank of Montreal is the oldest, having been established by a number of Montreal merchants in 1817. The Quebec Bank was established in the same year, largely by members of the same class in that city. This Bank has a paid-up capital of \$2,500,000, with seven branches, and has always been largely identified with the development of the trade in the productions of our forests which furnish so large a portion of the commerce of the ancient capital.

II. BANKING HISTORY.

For a very considerable time the Bank of Montreal and the Quebec Bank were the only banks that carried on business in that part of the Dominion then known as Canada, but now comprising the Provinces of Ontario and Quebec. The commerce of the country was in its infancy. Accurate statistics are not procurable until a much later period, and all that we know of banking statistics comes from the annual reports of those two institutions. A comparison between the puny developments of those early days and our own, will give a striking measure of the progress attained by the country during the last half-century. The Bank of Montreal, at its commencement, had a capital of \$350,000 only. At the end of its first year, it laid by as a reserve the sum of \$4,000. This modest reserved fund has now grown to \$6,000,000: no bad index of the growth of the country generally during the same period.

If we go back to the year 1830, we find that the total paid-up capital of the then existing Banks of Canada was \$1,300,000. It is now \$55,000,000.* Deposits at that time were less than \$2,000,000; they are now \$95,000,000. Discounts then were not over \$5,000,000; they are now \$155,000,000. To complete the comparison with deposits of the present day we must include \$29,000,000, now deposited in the Government Savings Banks; \$14,000,000, in various Loan Companies; and \$9,000,000, in the Savings Banks acting under Legislative sanction. None

* The returns of the banks of the Maritime Provinces are not included in these comparisons.

of these existed in former days. The total deposits of the country are therefore now \$147,000,000, as against \$2,000,000 in 1830.

When there was neither town, city, nor village in Ontario, then a wilderness inhabited merely by Indian tribes, Quebec and Montreal were comparatively important centres of population. The trade of those times was largely derived from the forest. The agriculture of the country was not sufficient to provide a surplus for export. The settlers produced sufficient for the consumption of the country, and no more. The principal trade was in furs, and, to a small extent, in timber.

It was partly national sentiment, and partly the pressure of necessity, that led to the occupation of Ontario. The merchants of Montreal supplied the rising settlements with such commodities as were needed, and received their produce in return. From such infantile beginnings arose that great internal commerce between Montreal and the people of Ontario, which has had so largely to do with the growth of the city. The enterprising merchants of Montreal seized upon every opening for business of a mercantile character. The Bank of Montreal in a similar manner reached out its arms, and in a quiet and almost primitive fashion established branches in one spot after another. For many years, the whole of the banking business of Ontario, such as it was, was done by one bank.

Later on, however, that sturdy feeling of independence and love of self-government, which have had so marked a development amongst us in the political sphere, manifested themselves in the purely economical matter of banking. Toronto had become a centre of government and education, and, to a small extent, of business also. About fifty years ago a Municipal Government was established within it, and about the same time an attempt was made to found an independent bank. A charter, modelled on that of the older banks, was obtained from the Legislature. It was provided that the bank should not commence business until the sum of £10,000 of the currency of those days, or \$40,000, was actually paid up. The whole Province, from end to end, was appealed to on local and patriotic grounds to raise this sum; but though it was easy to get stock subscribed, of actual money there was such a dearth, that it was found impossible to gather

enough together to comply with the provisions of the charter. The project was therefore in danger of collapsing, when some who had influence with the powers that be, succeeded in obtaining a loan on their own responsibility from the Military Chest in Toronto, and so made up the deficiency. The bank was thus enabled to commence operations. Ontario at that time was called Upper Canada. The bank therefore became the Bank of Upper Canada.

In the Province which was unable to raise \$40,000 of banking capital fifty years ago, there are now* twelve local banking institutions with an united capital, paid up, of \$18,760,000, deposits of \$40,000,000, discounts of \$65,000,000, and a circulation of \$11,000,000. All these institutions are modelled, both in their framework and internal discipline, after the older banks. All these banks have branches, though some of them confine their operations within the sphere of their own Province.

Some years ago the element of nationality entered upon this economic field, and a bank was organized of a different character from any then previously in the country. This was the principle of "*en commandité*:" that is, the directors were liable to the full extent of their means for all the engagements of the bank. In other words, it was a bank of unlimited liability so far as its directors were concerned. The stockholders of the other banks are liable for double the amount of their subscription, the only exception to this being the Bank of British North America, whose stockholders, by special exemption, are only liable for the amount of their stock. This principle of the full liability of directors, though apparently an attractive one, has not taken root in the community. The example has never been followed, even by other banks in which the element of separate nationality has prevailed. This bank was called "*La Banque du Peuple*," and it is still in existence.

A number of other Banks have been established in Canada which, while subject to the same general law, may be called French, as distinguished from English, from the fact that they have French names, are mostly governed by French directors, keep their accounts in French, and have all their cheque-books

* In 1884.

and documents in that language. They have not, however, in any case, spread themselves over the Dominion generally, and even in the Province in which they have been organized, their operations are comparatively limited. They have, however, shown remarkable tenacity of life under adverse circumstances. There are some now in existence whose career has been a marvellous one in this respect.

The banking development of the old provinces bordering on the sea, commonly called the Maritime Provinces of the Dominion, has been an entirely different one. Banking has there been carried on by a community largely of American origin. Though British ideas have prevailed in the political sphere, they have not in the financial, to the same extent as elsewhere in the Dominion. The number of independent banks bears a larger proportion to population and business, the tendency having been to establish banks in small places after the manner of the local banks of the United States. In some of these banks there has been manifested an absence of that training in the higher departments of banking, which is generally essential to stability.

In this respect Canada owes much to the Bank of British North America. With its headquarters in London, this bank has introduced amongst us the best elements and methods of British banking, and sent out to Canada a large number of well educated and efficient men whose influence has been potent in elevating the tone of banking business.

III. SOME STATISTICS.

For many years back Canada has had the advantage of a complete system of banking statistics. Commenced about thirty years ago under the régime of Mr. (now Sir Francis) Hincks, at that time Finance Minister and head of the government,—it first gave the people a complete and general idea of the operations of the banks of the country as a whole. They were required to make returns to the government, showing the amount of their capital, their circulation, their deposits and other liabilities, together with their available assets, discounts and other investments. These, after a time, were regularly published in the Canada Gazette, and the reports have been continued ever since

without intermission. The statistics, however, of the present day are more elaborate than formerly. They embrace the banks of all the Provinces of the Dominion. The first statistics included only the banks of Old Canada. With each decennial renewal of the charters, demands for further details have been made, many of which are regarded by practical bankers as little better than crotchets. The returns now required and published are according to the following form:—

SYNOPSIS OF THE RETURNS OF THE BANKS TO THE GOVERNMENT FOR
JUNE, 1884.

LIABILITIES.

Capital authorized.....	\$71,896,666
Capital paid up.....	61,443,397
Reserved funds.....	18,379,129
Notes in circulation.....	\$29,654,511
Dominion and Provincial government deposits.....	8,661,512
Deposits held to secure Government contracts and for insurance companies.....	488,973
Public deposits on demand.....	44,204,111
Public deposits after notice.....	53,239,654
Bank loans or deposits from other banks secured.....	262,007
Bank loans or deposits from other banks unsecured....	1,123,318
Due other banks in Canada.....	1,221,669
Due other banks in foreign countries.....	102,819
Due other banks in Great Britain.....	1,710,760
Other liabilities.....	303,893
Total Liabilities.....	\$140,973,227

ASSETS.

Specie	\$6,639,773
Dominion notes.....	10,260,875
Notes and cheques of other banks.....	8,042,582
Due from other banks in Canada	2,925,256
Due from other banks in foreign countries..	9,810,611
Due from other banks in Great Britain.....	2,974,449
Immediately Available Assets.....	\$40,653,546

ASSETS (Continued).

Dominion Government debentures or stock.....	\$908,549
Public securities other than Canadian.....	1,751,002
Loans to Dominion and Provincial Governments.....	7,882,433
Loans on stocks, bonds, or debentures.....	12,069,106
Loans to municipal corporations.....	1,699,027
Loans to other corporations.....	16,177,495
Loans to or deposits made in other banks secured.....	484,981
Loans to or deposits made in other banks unsecured.....	475,433
Discounts and loans current.....	130,280,429
Overdue paper unsecured.....	1,615,556
Other overdue debts unsecured.....	161,217
Notes and debts overdue secured.....	2,645,362
Real estate.....	1,122,300
Mortgages on real estate sold.....	803,318
Bank premises.....	3,106,021
Other assets.....	2,023,723
Total Assets.....	\$223,859,498

Average amount of specie held during the month.....	\$6,549,787
Average Dominion notes held during the month.....	10,404,825
Liabilities direct and indirect of directors and their firms ..	7,766,984

These statistics appear in the Official Government Gazette each month; and, as they embrace not only the totals above referred to, but the details of the condition of each bank, they are scanned with no inconsiderable amount of interest by bankers and capitalists.

The following summary will give a clear idea of the leading items of the returns for the month of June, 1884, classified according to Provinces:—

DESCRIPTION.	Banks in Quebec.	Banks in Ontario.	Banks in Maritime Provinces.	Total.
Capital paid up.....	\$36,299,000	\$18,764,000	\$6,380,000	\$61,443,000
Circulation.....	14,927,000	10,778,000	3,949,000	29,654,000
Deposits.....	55,383,000	40,345,000	10,866,000	106,594,000
Loans and Discounts.....	90,549,000	65,009,000	19,053,000	174,611,000
Cash and Foreign Balances net.....	18,427,000	7,228,000	2,213,000	27,868,000

It may be interesting to compare the totals here with those of some former years. The deposits of all the banks in Ontario and Quebec for the month of June, 1858, amounted to only \$12,000,000. This sum included the whole deposits of the Bank of Montreal, Bank of British North America, Bank of Upper Canada, Commercial Bank of Canada, and all others then in existence.

A summary of the returns of 1865 is appended for further purposes of comparison:—

LIABILITIES.	
Capital authorized	\$45,166,666
Capital paid up.....	30,647,412
Circulation	14,158,313
Due to other banks	1,484,009
Deposits not bearing interest	14,447,960
Deposits bearing interest	14,510,386
	\$44,600,669
ASSETS.	
Specie and Provincial notes	\$8,283,688
Landed or other property of the bank	2,927,591
Government securities	6,534,485
Notes and cheques of other banks	1,813,913
Due from other banks	5,983,023
Notes discounted.....	45,677,674
Other assets not included under foregoing heads.....	3,698,385
Total Assets.....	\$74,918,763

It thus appears that there has been an enormous development during the last two or three decades. Deposits since 1858 have increased from \$12,000,000 to \$95,000,000, or about 700 per cent. Since 1865, they have increased from \$29,000,000 to \$95,000,000, about 230 per cent. Paid-up capital since 1865 has increased from \$30,000,000 to \$61,000,000, or about 100 per cent. Discounts have increased from \$45,000,000 to \$155,000,000, or about 250 per cent. Circulation has increased from \$14,000,000 to \$29,000,000, or about 100 per cent.*

* These figures are for Ontario and Quebec only, no complete statistics of the banks of the Maritime Provinces having been published till 1871.

These statistics are such as to give Canadians confidence in the stability and growth of their country. Those who have witnessed, as the writer has, the whole of this remarkable growth, cannot but have faith in its future development, no matter what temporary clouds may obscure the prospect.

IV. CURRENCY AND NOTE CIRCULATION.

The introduction of the decimal currency was an important step in the development of the banking system. For a long period Canada had been content with a currency of her own, entitled the "Halifax Currency;" but, though this was not found to be inconvenient in practice, the increasing intercourse between Canada and the United States, caused by the ratification of a treaty for reciprocal trade, led to the passing of an Act about twenty-seven years ago, compelling all Government accounts to be kept in dollars and cents. From the date of the operation of that Act, though they were not under obligation to do so, all the banks changed their mode of notation. This was a comparatively simple thing, for every pound in the old currency represented \$4, being worth 20 per cent. less than the English sovereign, and every shilling was exactly equivalent to twenty cents. The superior convenience of the decimal system, when once introduced, led to its rapid and spontaneous adoption in all parts of the country. In this respect Canada differs entirely from the Australian Colonies, whose currency has always been identical with that of Great Britain.

The banking system of Canada has always been on a gold basis. Never, except during the exigencies of the Rebellion, and then only for a short time, have the banks suspended specie payment. Such economic heresies as an irredeemable currency, or a bi-metallic system, have never obtained footing here. The British sovereign, and the gold coins of the United States are both legal tender, being known to be of standard fineness; but our own silver is only legal tender to the extent of \$10, while United States silver is not legal tender at all, being a debased coinage. During the long period when the currency of the United States was at a discount, of sometimes as low as sixty per cent., the currency of Canada remained steady on a firm basis of gold. All

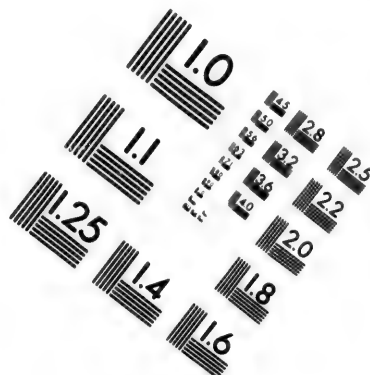
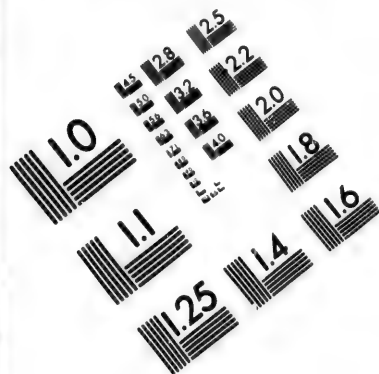
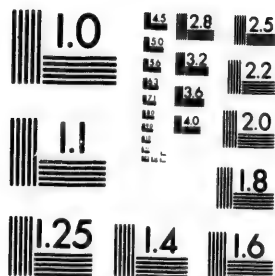


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her transactions with the United States were on this footing, and the command of gold, to very large amounts, proved at times a considerable source of profit to the Canadian banks having offices in New York.

The banks of Canada differ from those of the United States, while they resemble those of Scotland, in having a free circulation, limited only by the amount of their paid-up capital. They have had to contend at various times against attempts to abolish this liberty, and in this contention they have invariably taken the ground that, by their free circulation, they were serving the interest of the public. Against attempts to substitute for it a circulation composed entirely of the notes of the Government, they have contended:—

1st. That such a circulation, however guarded in theory, would almost certainly at some time, under pressure of circumstances, become irredeemable, fall to a discount, and be a source of incalculable disaster to the country. In support of this they pointed out that, though it was perfectly easy for a Government to issue promissory notes payable on demand, the task of *redeeming* them, in every instance where the experiment had been tried, had proved impossible of accomplishment. (The experiment of the United States had then been only partially tried, and its issue remains uncertain, even yet.)

2nd. It was pointed out that every Government currency then circulating in the world was at a discount; that such currencies in former days, though issued by Governments which had proved stable in other respects, had fallen to such a discount as to be absolutely worthless; that the laws of finance were invariable; and that what had happened before would inevitably, when like circumstances arose, happen again; that such circumstances, in the changing conditions of government and society, would almost certainly recur.

3rd. It was pointed out that, if the Government desired to borrow, it should do so in the open markets of the world, and on bonds or debentures maturing at fixed periods, the date of which was known, and provision for which could be made without disturbance to the monetary condition of the country.

4th. The broad ground was taken that, though it was the undoubted function of Government to stamp coin and to give

authority to issue, the function of redemption could never be successfully performed except by bankers.

These arguments, along with the very practical one that to abolish bank circulation would necessitate an immense contraction of discounts, and bring about an intolerable disturbance of trade and commerce, prevailed to this extent, that only a partial issue of Government notes was attempted. The Bank of Montreal, for a substantial consideration, agreed to circulate Government notes instead of its own, and to manage the business of redemption in its own offices.

Since the year 1871, the system has been continued and extended on a purely governmental basis,—the Bank of Montreal having resumed the circulation of its own notes. The amount of issues has been fixed by law; reserves of specie are held by Government treasurers in Montreal, Toronto, Halifax, St. John, Winnipeg, and Victoria (British Columbia); the notes are made legal tender; and bankers are compelled to hold a certain portion of their reserves therein. The power of issuing notes below the denomination of five dollars has exclusively devolved on the Government, such notes being the least likely to be presented for redemption in quantity. Thus guarded, the system of a partial issue of Government notes has been working among us since 1871, side by side with bank issues, without material disturbance.

It should be noted, however, that the only notes of the Government which can be considered in circulation, consist exclusively of one, two and four dollar bills. The rest consist of notes of larger denominations, used only by banks for the purpose of making settlements between one another. The former are, of course, in the hands of the public. The latter are rarely seen outside the banks themselves.

On two occasions attempts have been made by the Government to assimilate the circulation of the Canadian banks to that of the national banks of the United States, and to compel the depositing of Government bonds as security for issues. This attempt met with resistance from a majority of the banks, who contended:—

First. That to compel all issues to be covered by Government securities would necessitate such an enormous contraction of discounts as would bring disaster to every interest of the country.

Secondly. That a system of free issues, maintained at a healthy level by daily redemption (under which over-issues are impossible), expanding readily and easily when crops require to be moved and timber is being produced in the forest, and contracting just as naturally when these processes are accomplished, is far more suitable to a country like Canada, than a system by which issues are fixed and cannot be increased; whose inevitable effect is to concentrate masses of money in financial centres at one time—thereby stimulating speculation; and to draw them off at another—thereby tightening money.

Thirdly. That however suitable such a system might be when worked in connection with local banks, each a centre to itself, it would prove utterly impracticable where banks have numerous branches.

Lastly. When reference was made to the example of the United States, it was rejoined:—(1) That the covering of notes by security there had become the only practicable remedy for the unbearable evils of unsound issues. (2) That the National Banking Act was a war measure, devised mainly with reference to the stringent exigencies of the times. (3) That so far as the issue of currency was a part of it—though very admirable in many respects,—it had drawbacks which were most seriously felt, both in times of expansion and contraction.

These arguments were pressed on the attention of the Government, and placed prominently before the country through the medium of the Press. As thus set forth, they were endorsed by public opinion and accepted by Parliament. The banks have, therefore, been left with their free circulation, with the simple proviso that they shall not issue notes beyond the amount of their capital (a most ample margin), and that they shall not issue any notes of a lower denomination than five dollars. And, since July 1st, 1881, the notes of the banks are constituted a first lien on their assets.

It is much to be regretted that the amount of specie originally required to be held against Government notes, has been much lessened of late years. The inadequacy of the present reserve has been proved on more than one occasion, and the Government will doubtless take steps, at an early day, to have it put upon a proper footing.

V. EXCHANGES, DEPOSITS, ETC.

The banks maintain a constant system of exchanges with each other, though it is to be regretted that no clearing house has as yet been established amongst us. At the branches, as well as at their head office, the banks send in, not only cheques upon one another, but all the notes they have of their neighbours. For the balance thus created, drafts are drawn by branches upon cities where the larger banks have head offices. But at these larger centres, and particularly Montreal, all settlements between banks must be in gold, or its equivalent of Government notes. This constant sending in of notes for redemption acts as a perfect and automatic check upon over-issues.

The deposits of the Canadian banks are very small as compared with those England and Scotland, and even with those of Australia and other British Colonies. The contrast in this respect between Canada and Australia is very marked. In proportion to their population, the people of Australia have more than four times as much money deposited in banks as the people of Canada. This is a noteworthy fact. It arises partly from the Australian Colonies having been gold producing countries, and having had a much more rapid and continuous development of wealth; partly from the prevalence of habits derived from Great Britain, leading to a universal system of depositing in banks. The Canadian banks, in receiving deposits, which is their natural and proper function, have serious obstacles to contend with, some of them of an unreasonable character. The Government itself, through its Post Office Savings Bank, receives deposits. In this it emulates the example of England; but, unlike England, its rate of interest on deposits is such as to make the Government a direct competitor with the Banks. The rate of interest is actually higher than that of the leading banks; and besides, by allowing large sums to be accumulated by one person, in place of being simply a safe place of deposit for the poor, it has become a means by which the mercantile and financial community can get better rates for their spare money than the banks can afford to give. In addition to this, the Legislature allows the land companies established amongst us to receive deposits: again introducing the element of competition with the

banks. As a result of this, the rate of discount to the commercial community is higher than it otherwise would be. Merchants, manufacturers, and shippers are, in fact, taxed to enable a higher rate of interest to be paid to other classes. This is an undesirable state of affairs, and is one of the causes why mercantile failures have been so numerous amongst us.

The advantages or disadvantages of the Canadian system of branch banks have often been discussed. There is much to be said on both sides. In its favour, it may be urged that the system gives to depositors in all parts of the country, and in small places, the advantages of the security of an institution with a large capital with a double liability behind it. There can be little doubt, too, that sound ideas of business are diffused over every part of the country by means of the contact with the mercantile community of men who have been trained in such banks as those of Canada are. The directors and principal officers of such banks require to keep themselves advised of the condition of mercantile affairs in every district of the country, and, in fact, are well acquainted with it. The large capital and resources of central banks are thus available for the carrying on of enterprises which, located in smaller towns, would require a far larger amount of accommodation than any local institution could possibly give them. But the system, no doubt, has its drawbacks. The very fact that large masses of capital are available in small places encourages what is often an unhealthy development of business. A style of business which is only proper to great centres may be attempted in mere villages, to the ruin of the parties carrying it on, and to the great loss of the banks whose resources have been so unwisely diverted into an improper channel. It must be confessed, too, that the task of keeping the loans and discounts of twenty or thirty offices, and in widely diversified districts of country, in a sound and healthy condition, is one that has at times overtaxed the ability of even our ablest bankers.

VI. CONCLUSION.

In conclusion, bank failures in Canada have not on the whole been numerous; and, in the case of their occurrence, stockholders

are liable by law for double the amount of their subscriptions. Such failures have arisen from the same circumstances that have brought about embarrassment to banks in Great Britain. The locking-up of large sums of money in irrecoverable accounts, recklessness in making advances for illegitimate purposes, want of control over agents and officers at distant points, inefficient systems of inspection, glaring attempts to evade, override, or defy the provisions of the banking law,—all these have occurred in the management of some of our banking institutions, and have brought their inevitable consequences. It is a fact to be deplored that the losses suffered by banks in Canada have been on a scale that is almost unknown elsewhere. The imperfect development of the country in its early days, the want of such settled business traditions as prevail in Great Britain, the widely separated territories in which the banks do business, the various origins, antecedents and habits of our diversified population, and the speculative spirit which always pervades a young and rising community,—all these have combined to bring loss, first to the customer of the bank himself, and then to the bank which trusted him. In addition to this, there can be no doubt that competition has been far too severe between banks themselves, bringing large losses to them, and resulting in no advantage to their customers.

Such, in brief, is a general sketch of the past and present condition of banking in Canada. It is to be hoped that, for the future, sound traditions of British business and banking life will be more prevalent both in the mercantile community and among our banking institutions. It will be to the mutual advantage of both. To the one it will mean fewer failures. To the other it will result in a far smaller average of losses, and an entire avoidance of those dangerous courses which sometimes imperil a bank's very existence.

XIX.

*THE POST OFFICE SAVINGS BANK SYSTEM OF CANADA.**

BY J. CUNNINGHAM STEWART.

I. ORIGIN OF THE SYSTEM.

The inquirer into the origin and history of Post Office Savings Banks in a new country must not expect to meet with what may be termed the "prehistoric" element. As applied to the Post Office Savings Bank system in the United Kingdom, this term may not inappropriately be given to the condition of things existing in the three Kingdoms during the sixty years, or thereabouts, preceding the maturing and final development of that scheme in 1861, but which it is not the purpose of the present paper to discuss, further than to describe it as possible only in a country of dense population, where time and the operation of the laws of wealth had opened a gulf between the upper and lower strata of society, and where improvidence and squalor in the latter found, among the former, men of independent means with the leisure and philanthropic desire to take their humbler brethren by the hand and teach them lessons of frugality and providence. The successful launching of the Post Office Savings Bank in the mother country afforded instant relief from a condition of uncertainty and doubt begotten of the cruel and

*The Postal Savings Banks have not as yet been extended to the Maritime Provinces, or to Manitoba and the Northwest.

gigantic frauds which from time to time had startled society under the old Trustee Savings Banks. In the circumstances of its birth, then, no parallel must be looked for between the Post Office Savings Bank of Canada and the parent institution.

The successful ingrafting of a savings bank system on the machinery of the post office in England has been followed by the almost universal adoption by other nations, as well as, it is believed, by all the principal British Colonies, of measures more or less akin to the original. This circumstance, added to the varied experiences of different countries, with the desire to interchange such experiences, has given birth to a savings bank literature of especial value to those interested in postal savings banks. It is possible, therefore, although the Post Office Savings Banks by no means occupy the entire savings bank field in Canada, and are, as already stated, wanting in those earlier annals which give zest to the study of the parent system, that there are social and economic aspects under which it may be interesting to examine the Canadian system, and to these broader aspects may be added those features which are of peculiar interest to the accountant.

In the year 1867, there appear to have been in the Provinces of Ontario and Quebec regularly organized savings banks at Toronto, Cobourg, Hamilton, Montreal and Quebec, with deposits amounting to \$3,489,000 at an average rate of interest of 4 per cent. Only three of these savings banks now remain (1884), those at Hamilton, Quebec and Montreal. The proposition to adopt the Post Office Savings Bank system in Canada was introduced in the Canadian legislature during the November session of 1867, the first session after Confederation. Public attention had been attracted by the marked success of the British Post Office Banks, and several private individuals had addressed communications to the Government urging the adoption of a similar measure in Canada.

The proposed legislation received little attention in the Canadian press. At that time party politics were dormant, and the measure—provoking no adverse criticism—received little comment of any kind. The scheme was presented to Parliament as part of a general measure for the adoption of “an uniform postal system,” and the brief discussion which took place was

confined to the limit to be fixed for the deposits of a single depositor. The necessity for such limit was urged, not thereby to exclude from the use of the savings bank persons outside the wage-earning classes,—this being the fundamental idea in fixing a limit in the old British Savings Banks, and the principle followed in the British Post Office system,—but to guard the interests of the Canadian chartered banks whose working capital consists largely of deposits.

The fears on the part of those representing the banking interests that many of the deposits in those institutions would seek the Post Office Savings Bank, may have been emphasized by the financial panic of October, 1867, which shook many of the Canadian banks, one succumbing altogether. Sixteen years' experience, however, has, it may be believed, satisfied the banking institutions that they have so far little to fear from the Post Office Savings Banks. To this result the limit fixed for one person's deposits in the latter, viz., \$1,000, may have contributed. A really influential factor in swelling the deposits in the Post Office Savings Banks may be found in the general fall in the value of money since the year 1880, the Post Office Savings Bank rate of four per cent. remaining undisturbed. The subjoined figures (made up to June in each year), however, show that, while the deposits in the Post Office Savings Banks have very largely increased since the year named, the deposits in the chartered banks themselves have never been so large as during the last five years, when low rates of interest have prevailed:—

Year.	P. O. Savings Banks.	Chartered Banks.	Average interest allowed by Savings Bank Departments of chartered Banks.
1875	\$ 2,926,000	\$55,918,000	} 4 and 5 per cent.
1876	2,741,000	59,516,000	
1877	2,640,000	58,444,000	
1878	2,754,000	58,946,000	
1879	3,105,000	58,659,000	
1880	3,946,000	69,742,000	3 " "
1881	6,208,000	77,078,000	3 " "
1882	9,474,000	89,565,000	3 " "
1883	11,976,000	89,553,000	3 and 4 " "
1884	13,245,000	87,341,000	3 " "

The Canadian Post Office Act of 1867, in its savings bank clauses followed very closely the British Post Office Savings Bank Act. Later legislation, in 1875, abolished the requirement that the Post Office Savings Bank balance, as required by the Act of 1867, should be funded in Canadian Government securities. The balance now forms part of the unfunded debt of the Dominion payable in Canada.

The system went into operation on April 1st, 1868, at eighty-one of the larger places, including the chief cities, in Ontario and Quebec. The following year this number was increased to 213, and at present (July, 1884) the number is 343. The rules, so far as they affect the public, being almost a transcript of those of the British Post Office Savings Bank, need not be further than touched upon here.

A depositor when making his first deposit, signs a declaration that he is not already interested in any deposits in the Post Office Savings Bank in his own name or any other. The postmaster or other officer receiving the deposit—which must not be less than \$1, and must not exceed \$300 in any one year (except by special permission from the Department first obtained, when any sum not exceeding \$1,000 may be deposited at once), or \$1,000 in all—gives the depositor a pass book, in which are entered the particulars of the deposit, affirmed by the official date-stamp of the office. The postmaster sends to the head office at Ottawa daily a list of the sums lodged with him for transmission, the keynote to the depositor's safety lying, first, in the fact that in the head office only is his account kept; and secondly, in the requirement that he must see that he gets, for every deposit paid in, a direct receipt from the head office by return of post.

II. GROWTH AND PROGRESS.

A tabular statement exhibiting the operations of the Post Office Savings Bank, from April 1st, 1868, to June 30th, 1884, will be found further on. From this the gradual expansion of the system may readily be seen. There have been in all, since the beginning 852,143 deposits and 410,259 withdrawals. Of the total number of transactions, 101,461 (or about one in every

eleven) have been at places other than where the depositors' accounts were originally opened, showing how far depositors take advantage of their privilege of moving from place to place and depositing or withdrawing at pleasure without change of pass book.

The following figures, compiled partly from an examination of the ledgers, and partly from estimate, show with approximate accuracy the depositors classified according to occupation, and the sums held in the Savings Bank by each class :—

OCCUPATION.	No. of Depositors.	To credit of each class.	Average of each Class.
Farmers.....	14,000	\$4,722,000	\$337
Mechanics.....	7,850	1,422,000	181
Trust accounts and young children.....	5,500	170,000	31
Labourers, including sailors.....	4,270	724,000	169
Clerks.....	3,000	522,000	174
Tradesmen	1,800	468,000	293
Farm and other male servants.....	1,470	277,000	188
Professional	1,572	392,000	249
Miscellaneous	1,680	215,000	128
Married women.....	12,000	2,350,000	196
Single women.....	10,500	1,275,000	120
Widows	3,240	708,000	214
		\$13,245,000	

Explanation of the large number of accounts held in the names of women, particularly married women, may be found in the difficulty which farmers and artisans experience in leaving their work to visit the post office, the consequence being that the accounts are opened in the names of their wives or other female members of their families.

III. COMPARISON WITH UNITED KINGDOM STATISTICS AND GENERAL OBSERVATIONS.

Depositors in the Canadian cities consist to so large an extent of persons from the surrounding rural districts that it would be valueless to pursue to a comparison, which would be interesting were the conditions alike, the question of what analogy may exist, in

point of numbers, between depositors in Canadian centres of population and towns of like size in the United Kingdom.

The following are the statistics of the Province of Ontario and Quebec compared:—

	Depositors.		Amount Deposited.	Post Office Savings Banks.		Average Number of Depositors at each Bank.
	Actual Numbers.	Proportion to Population.		Actual Numbers.	Proportion to Population.	
Ontario	57,296	1 to 34	\$10,932,000*	279	1 for 6,965	205
Quebec. . . .	9,386	1 to 136	2,313,000	64	1 " 10,840	145

With these numbers may be compared the corresponding numbers in the United Kingdom. The proportion of depositors to population is in England, 1 to 10, in Scotland, 1 to 35. In the United Kingdom, the proportion of banks to population, is 1 for 5,000; the average number of depositors at each bank is 406.

In any attempt to measure the progress of the Post Office Savings Bank in Canada by that of its prototype, the different conditions of the two peoples, the old nation and the young, must be borne in mind. In the older country not only are social and class lines strongly marked, but trades and callings are pursued in such fixed grooves as to narrow the outlet for individual energy, and to limit the choice of investments where small surplus earnings may be placed. In the new Dominion on the other hand (and the same thing is doubtless true of all countries and colonies in their youth), the very desires which brought men or their parents across the sea, and the sense of the boundlessness of their country which possesses the people of the American continent, beget and keep alive an unrest and a movement which are destructive of all artificial barriers. There are fields of enterprise which cannot but attract the energetic and ambitious, and to every man are there possibilities in the acquisition of real property, sufficient to absorb all surplus wages or income. From the commonly accepted point of view that savings banks are for the storing of the small sums which

*Half of this is held in the two cities of Montreal and Quebec.

would otherwise find their way into the traditional "stocking" or "teapot," the wonder, on examination, is that the Canadian Postal Savings Banks have attained measurable success at all.

It must be remembered that the \$13,000,000 in the Post Office Savings Bank, by no means represent the entire savings deposits of the two Provinces of Ontario and Quebec. The deposits in the chartered banks (numbering with their agencies 222) have already been quoted as amounting to \$87,000,000. What proportion of this may fairly be termed savings deposits there are no available data for determining. To the chartered banks must be added ninety-three building and loan societies, whose liabilities to upwards of 30,000 depositors, according to the latest returns, were \$15,000,000. The old-established savings banks in the cities of Montreal and Quebec hold, in round numbers, \$9,250,000 in the names of 42,297 depositors.

Attention cannot fail to be attracted to the magnitude of the average deposit in the Canadian Post Office Savings Banks, a sum, in round numbers, of no less than \$60,—the average deposit in the United Kingdom being £2. In Canada the deposits number 1.66 in the year by each depositor. In the United Kingdom the average is 2.15. In the year 1881, three branch savings bank offices were opened in the suburbs of the city of Toronto; and it was hoped that the result of bringing savings bank facilities nearer to the homes of the industrial classes in a large city would appear in a numerical increase in the small deposits. The average deposit at these three suburban offices is \$28, half the usual average, and the frequency of deposits is 2.75 per annum for each open account. After three years' trial, the number of depositors is, however, only 615. The transactions at the two suburban offices in the city of Montreal, present results nearly identical. The attempt to bring the advantages of the Post Office Savings Banks within the reach of the classes on daily or weekly wages has so far, therefore, been only partially successful. It is necessary to state, however, that such attempt has been confined to the simple opening of the branch offices. The Canadian Department has not sought to attract depositors by means of pamphlets, nor otherwise attempted a paternal treatment of the people, which would hardly find favour in this country.

The writer's observation justifies the general deduction, which, had it nothing but statistics as a basis, might be delusive, that the people of the Province of Ontario may properly be described as thriving rather than thrifty. Whether the monetary unit of trade and the value of wages \$1.00 (four times the English *shilling* and German *mark*, and five times the *franc*) has anything to do with begetting a contempt for the fragments, the cents, is a question beyond the scope of this paper. Wages are not earned without fair equivalent in labour, so that it cannot be said that men do not value what costs them little effort. The necessities of life are cheap, and it cannot be asserted that the coarse enjoyment of the present absorbs the surplus earnings of the working classes. The deposits now accumulated in the Post Office Savings Banks may be said to be in, although hardly saved by means of, those institutions,—the virtue of habitual saving being one yet to be acquired.

The people of the sister Province of Quebec—that is, those of French Canadian nationality, who represent five sixths of the population of that Province—are eminently frugal and simple in their manner of living and expenditure. While neither the same gross, nor a like average, amount of deposits could be looked for as in the richer Province of Ontario, it might be expected that the French Canadian rural population would, nevertheless, use the Post Office Savings Banks to a larger extent than the official records show to be the case. The old-established savings banks in the cities of Montreal and Quebec have already been mentioned as having deposits amounting to \$9,250,000. The depositors in the former number (according to returns published on Dec. 31st, 1883,) 29,756, of whom 18,357 are of French Canadian nationality, a large percentage being from the country districts round Montreal. Of the 12,541 depositors in the Quebec Savings Bank it is probable that those of French Canadian nationality are a large majority.

It is possible that the French Canadian rural population, accustomed for generations to the institutions and simple customs inherited from their parent country, France, and to the system which makes the village notary to them the visible and personal medium through whom are executed on the spot all legal forms, do not grasp the abstract idea of a savings bank at the

seat of government, perhaps many hundred miles distant, which guarantees perfect security to their deposits from the moment of their being handed to the village postmaster. Having little contact with immigrants from the British Isles, the rural population of the Province of Quebec have not, moreover, the opportunities of becoming familiar with the working of post office savings banks, which association with persons, themselves depositors, would afford.

The plan of collecting the minimum deposit (one dollar) by means of postage stamps affixed to a form provided by the Department for the purpose, has not commended itself to the Canadian authorities. It is believed that in this country better results may be achieved by the unselfish efforts of philanthropic persons in connection with "Penny Banks." Three of these institutions in the city of Toronto may be mentioned as having attained a success, which is entirely due to that kindly influence on the part of their promoters which is essential in any effort to reach the humbler classes, and which the machinery of the Post Office could not supply.

IV. COST OF THE SYSTEM.

The Post Office Savings Banks in Canada are maintained at a cost to the Government of about 4.10 per cent. on the balance due to depositors. Of this charge the interest allowed to depositors represents about 3.85 per cent., and the expenses of management are 0.25 per cent. The difference between 4 per cent., the declared rate of interest, and the distributed rate suffices to pay about one half of the expenses of management. The cost per transaction is $20\frac{1}{2}$ cents,—somewhat more than it would be, did the requirements of the country not compel the printing of pass books and all official forms in the French as well as the English language. One of the most satisfactory points to be noted is the almost entire absence of loss arising from any cause. Fourteen of the sixteen years of the Savings Banks' history have been absolutely free from casualty. The loss on a business represented by 1,262,402 transactions and \$83,000,000 has been only \$6,517, say $\frac{3}{4}$ of a cent for each \$100. The entire loss, except the small sum of \$390 lost through the

successful personation of a depositor, occurred through frauds by a single officer in the year 1878. Although the depositors who were the victims of these frauds had, in most instances, owing to their lamentable neglect of the regulations made for their safety, no legal claim against the Department, the losses were made good in view of the extreme hardship of the cases.

V. ABANDONED FEATURES.

The history of the Canadian Post Office Savings Bank would not be complete without a reference to two features formerly, but no longer, ingrafted on the system. The first was a plan by which depositors could transfer their ordinary deposits, in sums of \$100, to a special 5 per cent. account,—such 5 per cent. moneys being repayable on three months previous notice. This system was remarkably smooth in its operation. It was intelligible to depositors, and, in the ledgers of the Department, the interest on the balances at 5 per cent. was computed with ease.

It being thought that these special deposits—being really investments of a more or less permanent character—should be under the direct management of the Finance Department, the system just described was discontinued in 1872, and a special issue of 5 per cent. Government stock was substituted. Under the latter arrangement, the Post Office Savings Bank ceased to have any knowledge of, or responsibility for, amounts transferred for inscription in stock in the Finance Department, the latter undertaking the payment of half-yearly dividends and subsequent redemption.

The second system was discontinued in 1880, with the general fall in the value of money. It was not satisfactory in its operation. Depositors, whose money had been transferred to Dominion stock, could not understand how, by a simple book-entry at Ottawa, they had ceased to be depositors in the Post Office Savings Bank. The Finance Department, in transmitting half-yearly dividends, was unable to follow depositors' changes of residences, and generally it may be said that, owing to its apparent complexity, the system did not tend to popularize the Post Office Savings Banks.

VI. INNER WORKING AND METHOD OF BOOK-KEEPING.

To those familiar with the inner working of Post Office Savings Banks, a branch of the subject which furnishes a literature of its own, a brief description of the mode of keeping depositors' accounts in the Canadian Post Office Savings Bank may be interesting. The rate of interest fixed by statute—\$4 per annum for each \$100, being \$12 for each \$300,—is, it will be seen, exactly *one cent a month* for each even sum of \$3, just as (at $2\frac{1}{2}$ per cent.) one halfpenny per month is allowed in the British Post Office Savings Bank for each complete pound. The latter is, in fact, the key to the computation of interest in depositors' accounts in the British system. So convenient did this analogy appear, that the Canadian Post Office Act of 1867 expressly confined the calculation of interest to sums of \$3 or some multiple thereof. (This was altered at the first opportunity, viz., in 1875, \$1.00 being then made the factor for purposes of calculation.)

It became evident to the officers entrusted with the organization of the Canadian system, that the British plan of calculating interest would be entirely inapplicable, for, whereas in one system the unit for calculation of interest (the pound) stands prominent in a column of its own, the Canadian unit, \$3, would not appear as a visible basis on which to compute, but would itself form matter for calculation, month by month, in each account. It was then, after much thought and careful experiment, decided to adopt the plan not altogether new, but new in Canada, of calculating the interest in advance; a decimal currency in connection with a 4 per cent. rate of interest, making the table for the purpose remarkably simple. Indeed, for four months of the twelve, *i.e.*, the first month in each quarter, the table may be dispensed with altogether, the operation being to multiply the dollars of the deposit by 4, 3, 2, or 1, according to the period of year as it advances, and treat the result as cents.

To illustrate the method: A deposit of \$60 in September, multiplied by three, would be credited with \$1.80 interest up to the end of the savings bank year, June 30th. The interest credited for the same amount if deposited in December would be \$1.20. In case of withdrawals, depositors' accounts are in like

manner charged with prospective interest up to the end of the current year. This was the method of computing interest adopted, and it has been in successful operation ever since.

There was much expenditure of effort during the first two years in the endeavour to conform rigidly to British precedent. Abstracts of the transactions were taken from the ledgers quarterly, and the depositors' ledgers accounts were balanced and ruled off at the end of each year at the cost of much time and labour. It was soon apparent that the quarterly summaries failed to give the proof which was their sole object, and that, even if satisfactory in that respect, the interval between the making of the entries and the discovery of error was too great. It was remarked that the average number of transactions in each account did not exceed two a year, and this suggested the abandonment of all summaries from the ledgers, except the annual one, and the substitution (if such could be devised) of such daily verification of the deposit and withdrawal entries in the ledgers as would place their accuracy beyond question. In other words, it was believed that the time and labour heretofore expended in tracing errors months after their occurrence could be more economically and far more advantageously employed day by day in their prevention. Such a plan was devised, and it has been in successful operation for fourteen years. The opportunity was taken to simplify the pattern of ledger account, and a specimen of that now in use (there being twelve on each page) is printed on the opposite page.

In the Account opposite, the process followed on June 30th in each year is illustrated by the black figures. In the original ledgers these entries are made in red ink. The figures in the right hand column refer to the record where will be found the particulars of each transaction as extracted from the ledgers on the date of entry. The dates in the same column indicate the day on which the pass book was received for annual verification.

It will be observed that the process of ruling off and balancing the account at the end of each year is entirely dispensed with. The accuracy of the deposits and withdrawals having already been established, all that it is necessary to do is to insert in the "deposit" column the interest, already computed in advance, add it to the balance of principal, and compute the interest for

"BROCKVILLE" LEDGER.

[972.]

HENRY BROWN, *Farmer.*

Date.	With- drawals	Deposits.	Balances.	Balance of Interest.	Balance Special Account.	Refer- ences.
1878	\$	\$	\$	\$		67
Dec. 20	....	50.00	50.00	1.00 06		70
Dec. 29	....	3.00	53.00	1.06 07		103
Mrch. 11	....	7.00	60.00	1.13 12		51
Aprl. 9	12.00	....	48.00	1.01		20-12-79
1879	....	1.01	49.01	1.96 90	Not now in use.	170
Sept. 14	....	30.00	79.01	2.86 93		51
Oct. 21	31.00	....	48.01	1.93		23-12-81
1880	....	1.93	49.94	1.96 1.24		320
Dec. 9	....	62.00	111.94	3.20		19-12-81
1881	....	3.20	115.14	4.60		
1882	....	4.60	119.74	4.76 3.99		
Sept. 2	119.74	....	0.00	77		51
	162.74	162.74				

the following year. The three columns, Deposit, Balance, and Interest, are conveniently grouped together. An abstract is then made, which not only gives the total of the year's interest, but furnishes a final and conclusive proof on the ledger entries.

So rapidly can accounts in this form be treated at the close of the year that, in respect to the fiscal year just closed, June 30th, 1884, it may be said that the labour of balancing all the ledger accounts, 66,862 in number, was completed on the third day after,—necessarily during extra hours, but without interruption to the daily work. On July 18th, the labour of extracting from the ledgers the year's balances and transactions in 87,621 accounts, of adding them, and of bringing the year's operations to a final proof was concluded. It will be apparent with what ease a depositor's account can be closed and interest paid him under the above system, and what smoothness this fact imparts to the daily work, little more labour being involved in making an entry of this kind than in entering an ordinary withdrawal. The great object is also attained—the advantage of which will be understood by all persons having had practical experience of the management of large numbers of accounts, involving numerous transactions—of conducting the business of the Department on a strictly daily basis. There is no link in the work of a weekly, monthly, or quarterly character requiring constant supervision lest it be neglected. There are neither arrears, nor the possibility of any. It is believed that the system of computing interest prospectively, now followed in the Canadian banks generally, was first introduced into Canada by the Post Office Savings Bank.

It is right to say that the officers of the Canadian Department, when making what seemed a bold departure from the conventional form of keeping and balancing deposit accounts, took no little courage from an examination of the evidence given before the Select Committee appointed by the British House of Commons in 1858 to enquire into the operations of the Savings Banks; particularly that of Mr. Craig, agent in Cork of the Bank of Ireland, and treasurer of the Cork Savings Bank; and of Mr. Maitland, treasurer of the Edinburgh Savings Bank. Those who take an interest in such enquiries will be rewarded by a perusal of these gentlemen's testimony and views.

The staff of the central or head office of the Canadian Post Office Savings Bank numbers twenty-one. These are not all employed in the ordinary routine of treating deposits and withdrawals, there being a constantly growing class of work in connection with claims to the moneys of deceased depositors, and other matters arising out of the regular duties. Then there are the postmasters' daily returns to be checked, and acknowledgments of deposits to be written, and the cross transactions (already described as one in eleven) adjusted, so as to bring the ledgers into agreement with the postmasters' returns, an agreement which cross-entries disturb. To these must be added many other minor duties. The clerical force of the Canadian Department is in the proportion of one to each 3,200 depositors' accounts, or one to each 7,900 transactions in a year. It is believed (although the figures given are subject to correction) that in the British Savings Bank Department the force is in the proportion of one to each 3,100 accounts, or one to each 8,770 transactions. If the analogy in the relations between labour and achievement be as close as these figures indicate, the Canadian Department may feel encouraged,—the British Post Office Savings Bank being deservedly and universally looked upon as a model of organization and successful administration.

STATEMENT

PER

Three months ended

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

Year ended June

* The figures in sn
Department to be in sc

STATEMENT of the Business of the Post Office Savings Bank, Canada, year by year, from April 1st, 1868, to June 30th, 1884.

PERIOD.	No. of Deposits received during period.	Total Amount of Deposits received during period.	No. of Withdrawals during period.	Total amount withdrawn during period.	No. of Accounts opened during period.	No. of Accounts closed during period.	No. of Accounts remaining open at close of period.	Interest allowed to Depositors.	Total Amount standing to the credit of all Open Accounts, inclusive of interest allowed, at close of period.
Three months ended June 30th, 1868	3,247	212,507	166	8,857.48	2,146	44	2,102	939.37	204,588.89
Year ended June 30th, 1869.....	16,653	927,885	4,787	296,754.35	6,429	1,319	7,212	21,094.72	856,814.26
Year ended June 30th, 1870.....	24,994	1,347,901	9,478	664,555.51	7,823	2,857	12,178	48,689.08	1,588,848.83
Year ended June 30th, 1871.....	33,256	1,917,576	15,148	1,093,438.86	9,424	4,449	17,153	84,273.68	2,497,259.65
Year ended June 30th, 1872.....	39,489	2,261,631	19,325	1,571,665.19	10,846	6,940	21,059	116,174.55	3,096,500.01
Year ended June 30th, 1873.....	44,413	2,306,918	22,159	1,925,999.32	11,995	9,528	23,526	126,932.88	3,207,051.57
Year ended June 30th, 1874.....	45,329	2,340,284	24,248	2,086,243.42	12,048	10,606	24,968	126,273.31	3,204,965.46
Year ended June 30th, 1875.....	42,508	1,942,346	24,637	2,041,879.04	10,516	11,190	24,294	120,758.06	2,926,090.48
Year ended June 30th, 1876.....	38,647	1,726,204	23,127	1,783,257.97	10,218	10,097	24,415	110,116.08	2,740,952.59
Year ended June 30th, 1877.....	36,126	1,521,000	21,643	1,525,682.98	8,971	9,312	24,074	104,067.86	2,639,937.47
Year ended June 30th, 1878.....	40,097	1,724,371	21,065	1,486,158.73	10,058	8,597	25,535	103,834.29	2,754,484.03
Year ended June 30th, 1879.....	43,349	1,973,243	22,326	1,475,048.79	10,755	8,845	27,445	110,912.56	3,105,190.80
Year ended June 30th, 1880.....	56,031	2,720,216	26,043	1,820,213.16	14,407	10,487	31,365	136,075.47	3,945,669.11
Year ended June 30th, 1881.....	71,747	4,175,042	28,398	2,072,289.15	18,731	10,491	39,605	184,904.81	6,208,226.77
Year ended June 30th, 1882.....	97,380	6,435,989	35,859	3,461,619.31	25,778	13,920	51,463	291,065.07	9,473,661.53
Year ended June 30th, 1883.....	109,489	6,826,266	45,253	4,730,995.39	27,127	17,531	61,059	407,305.17	11,976,237.31
Year ended June 30th, 1884.....	109,388	6,441,439	56,026	5,649,611.13	26,562	20,939	66,682	477,487.46	13,245,552.64

* The figures in smaller type in these two columns exhibit further withdrawals not paid to depositors in cash, but at their request paid over to the Finance Department to be inscribed in their names in Dominion Stock.

XX.

DOMINION GOVERNMENT SAVINGS BANKS.

BY THOMAS D. TIMS.

There are probably many, even in Canada, unaware of the fact, that the Post Office Savings Bank system has not yet been extended beyond the limits of Ontario and Quebec; as well as, that there has been in existence for many years, chiefly in the Maritime Provinces, another class of Government Savings Banks, managed in the Finance Department at Ottawa, at which the aggregate balances due to depositors at the end of the last financial year exceeded those that have accrued in the Post Office Savings Banks by several millions of dollars. A brief glance at the origin, development, and present position of this latter class of Government Savings Banks may not, therefore, be found uninteresting to the student of the financial history of the Dominion of Canada.

When the union of the Provinces of Canada with Nova Scotia and New Brunswick took place in 1867, the Dominion Government assumed, in accordance with the terms of the B. N. A. Act, the liabilities and the management of a number of Government Savings Banks, attached to the offices of the various sub-Treasurers (Collectors of Customs) at various outposts in the Province of New Brunswick, where on the first Monday of every month deposits were received bearing 5 per cent. interest. On the following day only, withdrawals, of which notice had previously been given, were paid. The balances at the credit of depositors

at all these offices—of which there were nine open—on July 1st, 1867, amounted to about \$242,000.

In Nova Scotia, a Savings Bank had been established, many years previous to Confederation, in connection with the Provincial Treasurer's Office at Halifax, in which deposits were received, and withdrawals, subject to notice, daily paid. The rate of interest in Nova Scotia was then fixed at 4 per cent. per annum. The liabilities of the bank at Halifax, assumed by the Dominion on July 1st, 1867, when the Finance Department took charge of the management, amounted to about \$644,000.

A Savings Bank at St. John, N.B., had also been established before 1867, under the management of honorary trustees, at which two days in every week were set apart for business with the public: one, to receive deposits; the other, to pay withdrawals, subject to a week's notice. The moneys received on deposit were invested in bonds of the Province of New Brunswick, bearing 6 per cent. interest, redeemable at any moment on the requisition of the trustees, as funds were required to meet withdrawals at the bank. Depositors were allowed 5 per cent., leaving a margin of one per cent. to cover expenses. The profits accruing were partly used in the erection of a handsome bank building, subsequently acquired by the Dominion Government, and partly devoted to local public purposes. During the session of 1871 a General Savings Bank Act, applicable to the whole Dominion, was passed by Parliament. This Act contained a clause declaring the St. John Savings Bank a Government Savings Bank from July 1st, 1867. Negotiations with the trustees resulted in a transfer of the institution to Dominion management after July 1st, 1871, at which date the balances due to depositors had increased from \$534,867 on July 1st, 1867, to \$751,789.

In the year 1871, a Government Savings Bank was opened in the newly-created Province of Manitoba, in connection with the Assistant Receiver-General's office at Winnipeg. In this year British Columbia became a Province of the Dominion. A head Savings Bank had been in operation for a few years at Victoria, with branches at New Westminster, Nanaimo, Yale and Cariboo, all under the control of a Board of Trustees at Victoria, who deposited the moneys received with Government. In order to avoid complications, in effecting a transfer of these Savings Banks as

they then stood to the Dominion, an arrangement was made with the trustees, in accordance with a clause in the Colonial Ordinance under which they were established, to wind up their affairs by paying off depositors. This was accordingly done during the year 1872; and on January 1st, 1873, Savings Banks, under the Dominion Law, were opened at Victoria, Nanaimo, and New Westminster.

During the year 1872 a Government Savings Bank was opened in connection with the Assistant Receiver-General's office at Toronto. In the same year there were also eighteen branch Savings Banks established in the principal towns of Nova Scotia, as well as a few additional branches in New Brunswick.

On July 1st, 1873, Prince Edward Island entered the Canadian Confederation, and on that date the liabilities, amounting to about \$250,000, of the Provincial Savings Bank at Charlottetown, as well as the management, were assumed by the Dominion Government.

On June 30th, 1883, there were the following Savings Banks open under the direct control and management of the Finance Department:—

PROVINCES.	HEAD OFFICES.			No.	BRANCH OFFICES.		TOTAL DEPOSITS.
	At	Depositors.	Balances on deposit.		Depositors.	Balances on deposit.	
NOVA SCOTIA...	Halifax..	6,134	\$2,463,695	28	10,024	\$3,326,937	\$5,790,632
NEW BRUNSWICK	St. John.	6,695	2,053,943	12	5,165	1,842,344	3,896,287
ONTARIO	Toronto .	1,618	673,824				673,824
MANITOBA	Winnipeg	2,286	585,200				585,200
PRINCE EDWARD	Charlotte-						
ISLAND	town ..	3,310	1,159,428				1,159,428
BRIT. COLUMBIA	Victoria..	2,808	1,666,034	2	847	471,465	2,137,499
	Totals .	22,851	\$8,602,124		16,036	\$5,640,746	\$14,242,870

At all these offices the rate of interest has been fixed for some years at 4 per cent. per annum, computed from the first of the month following the date of deposit up to the first day of the month in which moneys are withdrawn. The limit to deposits in the name of any adult member of a family is at present \$3,000.

The united deposits of the head and minors of a family combined, cannot exceed this limit at any Savings Bank.

At the time when interest was fixed at the uniform rate of 4 per cent. in all the Provinces, a special issue of Dominion Stock, bearing 5 per cent. interest, payable semi-annually, was authorized; to which, deposits in Savings Banks under Government control could, after three months, be transferred in round sums of \$100, or multiples of \$100, up to a maximum limit of \$1,000, redeemable on three months' notice. The amount transferred from these Savings Banks up to 1881, when the further issue of stock ceased, reached \$2,338,800, of which about one half had been redeemed in 1883.

At all the Savings Banks under the management of the Finance Department, deposits are received and withdrawals paid without notice between the hours of 9 a.m. and 3 p.m. daily, in sums of not less than a dollar and multiples of a dollar. In respect to withdrawals, the facilities are greater than at Post Office Savings Banks, where no withdrawal can be effected without an application being made in every case to, and authority specially given by, the Post Office Department at Ottawa, for the payment.

Among the advantages enjoyed by the depositors in these Government Savings Banks are perfect security from loss, and every possible facility for making deposits and obtaining any moneys that they may require to draw out, without previous notice at the agencies, where their accounts have been opened from day to day. Under Rule No. 10, "Deposits may be made by, or for the benefit of, any person under twenty-one years of age. . . . Repayment to a minor over ten years of age shall be made in the same manner as if he were of full age. Deposits may also be made by married women, and deposits so made, or made by women who shall afterwards marry, will be repaid to any such women, and the receipt of any such woman, irrespective of her husband, shall be valid." In case of the migration of a depositor the balance at his credit in one office can be transferred to another agency without any cost or even loss of interest to the depositor.

Tables compiled from official data with great care show that on June 30th, 1883,—the latest date up to which returns have been submitted to Parliament,—the percentage of the cost of

management to the balances at the credit of depositors was \$0.35. The gross transactions, from July 1st, 1867 to June 30th, 1883, were as follow :—

	Deposits.	Withdrawals.	Interest accrued.	Balances, June 30.
1867	.....	.....	.....	\$1,422,046
1868	\$292,994	\$297,899	\$66,070	1,483,219
1869	323,138	281,360	69,528	1,594,525
1870	462,481	311,563	77,127	1,822,570
1871	556,669	395,458	126,674	2,110,455
1872	1,085,289	1,142,346	100,835	2,154,233
1873	2,442,917	1,732,872	93,891	3,208,112
1874	3,207,688	2,564,996	154,491	4,005,295
1875	3,570,288	3,508,389	177,896	4,245,091
1876	3,222,672	3,343,169	178,572	4,303,165
1877	3,911,567	3,574,204	190,156	4,830,693
1878	5,366,358	4,687,338	232,816	5,742,529
1879	4,549,290	4,431,992	242,665	6,102,492
1880	5,240,195	4,504,129	268,728	7,107,287
1881	6,494,639	4,297,355	323,873	9,628,445
1882	7,090,434	4,835,827	411,948	12,285,000
1883	7,067,390	5,624,907	505,387	14,242,870

RECAPITULATION.

Balance accrued prior to Confederation in Nova Scotia and New Brunswick	\$1,422,046
Increased liability for interest accrued in St. John, assumed by Dominion in 1872	38,417
P. E. Island Savings Bank, assumed 1873	249,941
Total assumed under B.N.A. Act.....	\$1,710,404
Deposits, July 1, 1867, to June 30, 1883.....	54,884,021
Interest accrued during same period	3,182,252
	\$59,776,677
Withdrawals, do. do.....	45,533,807
Due 38,887 depositors June 30, 1883.....	\$14,242,870

being an average of \$366 at the credit of each depositor. If to this balance be further added \$1,150,000, the amount of unredeemed 5 per cent. stock originally issued through these offices, there will be a grand total of \$15,460,000 saved. through this agency alone up to June 30th, 1883.

XXI.

ONTARIO LOAN AND SAVINGS COMPANIES.

BY W. A. DOUGLASS.

The building societies or loan companies first formed in Ontario were established on the terminable plan after the model of the building societies in Britain. It was soon found, however, that permanent institutions could operate much more advantageously; the terminable societies therefore are now almost, if not altogether, unknown. Of the companies now in operation, the oldest worth mentioning commenced in 1855 with a capital reported in the first annual statement at \$17,000, and total assets of \$68,800. The Report for December 31st, 1883, enumerates seventy-three companies, having a paid-up capital of \$28,028,625 and total assets, \$79,555,474. The paid-up capital of the banks at the same date was \$18,432,760. All these companies are founded on the principle of limited liability, the limit in every case being the amount of the subscribed capital.

Most of these companies are authorized to take money on deposit and to borrow by the issue of debentures, and, in the case of those companies that operate under the General Act, the borrowing power is limited as follows: the deposits cannot exceed the paid-up capital; and the total "borrowings," including the deposits, are limited to three times the paid-up capital. In most of the companies the only security on which they can lend is real estate or the company's own stock. The prevailing rate of

interest is at present seven per cent. in the Province of Ontario, and from eight to ten in Manitoba.

The following table gives approximately the rates of interest ruling for the last twenty-one years :—

	Per Cent.		Per Cent.
1863.....	12	1874.....	8-9
1864.....	12	1875.....	8-9
1865.....	12	1876.....	8-9
1866.....	11	1877.....	8-9
1867.....	11	1878.....	8-8½
1868.....	11	1879.....	8-8½
1869.....	11	1880.....	7-8½
1870.....	11	1881.....	6½-7
1871.....	9-10	1882.....	6½-7
1872.....	8- 9½	1883.....	7
1873.....	8- 9	1884.....	7

In the early period of loaning, the mortgages were mostly repayable by equal annual instalments, including interest and sinking fund; but the calculation of annuities was so utterly bewildering to farmers, and the adjustment of accounts in case of transfers so difficult and hence often so unsatisfactory, that the instalment method has been very largely if not wholly abandoned. There are no usuary laws in Ontario, otherwise I am inclined to think that these companies would be less numerous.

In Great Britain, building societies were organized principally to enable artisans to obtain homes; in the Territories of this country, they are used largely to enable settlers to buy and improve farms. When land is cheap, the settler may for several reasons be quite willing to borrow a sum of money to procure land, even though the rate of interest is very high. With a thousand dollars of his own money, and another thousand borrowed, he can obtain twice the acreage. He knows that the price will advance. If he rents, he obtains none of this advance. If he buys and mortgages, all the improvements that he makes, all increased land values, are his. Hence tenants are few, mortgagors are many.

Until about the year 1874, most of the loan companies obtained their funds from local sources, but about that year some of the largest companies entered the British market and obtained funds

by the sale of debentures. The amount thus borrowed now amounts to \$25,679,803. It may be interesting to notice, as an instance of the aid that science gives to commerce, that a large portion of this money is transmitted across the ocean by telegraph. The sun crosses the meridian at the rate of only fifteen degrees per hour. Electricity travels much faster than that; so that we may witness the extraordinary phenomenon of a capitalist buying a loan company's debentures at noon in England, the agent advising by telegram to Toronto, and the advice arriving some hours before noon; at the same time an agent in Winnipeg is drawing for the amount, which he hands to a mortgagor. The transaction begun at noon is completed half-way round the globe some hours before noon on the same day.

The money placed with these companies on deposit shows a rapid increase, from \$4,335,674 in 1874, to \$13,161,506 in 1883. If to this latter amount we add the debentures sold in Canada, \$3,591,466, the sum amounts to \$16,752,972, an increase of nearly 300 per cent. in nine years. The increase of savings placed in the Government Savings Banks during the same time in the Provinces of Quebec and Ontario (I have not the returns for Ontario alone) shows a slightly more rapid rate of increase from \$3,207,452 in 1873, to \$13,245,553 on June 30th of the present year. The bank returns (for Ontario and Quebec) for the same period show an increase from \$63,588,770 to \$86,630,464, an increase of about 36 per cent.

These figures would seem to indicate a rapid growth of wealth; but, while they undoubtedly show increased wealth somewhere, we must never overlook the fact that an increase in the above figures shows simply increased credit to one party and debit to another. In the early history of any settlement, savings are probably as rapid as at any other period, but statistics would not indicate such to be the fact; for the surplus savings do not pass through any savings institution, but are invested directly either in the purchase or in the clearing of land, in the payment of workmen for the erection of buildings or fences, for making drains, or for other improvements.

One of the most interesting considerations respecting the social conditions of any people is the possibilities of saving. Each family needs a certain minimum amount for sustenance and

education. Any surplus income above that minimum may be saved. We may appreciate the importance of this inquiry, when we observe that labour produces the wealth of commerce, but labour does not possess the wealth. From information obtained from Trades Unions by the Bureau of Industries for Ontario, I find that in four leading cities 590 workmen, aided in some cases by their families, saved last year a total of \$25,742, or an average of \$43.66 each.

The following figures are also reported :—

Average wages of workmen without dependents.....	\$376.68
Average cost of living.....	270.02
Leaving a surplus of savings amounting to.....	\$106.66
Average wages of workmen with dependents.....	\$470.22
Average cost of living.....	441.85
Leaving a surplus of savings amounting to.....	\$ 28.37

Out of a total of 590 workmen, 360 saved an average of \$71.50; while 230 saved nothing, and twenty-eight reported that their earnings were not equal to the cost of living. These returns include only skilled artisans, so that they give only approximately the possibilities of saving on the part of unskilled labour.

The Provinces of Ontario and Quebec present some striking differences in their financial institutions:—

	Ontario.	Quebec.	Proportion of Ont. to Que.
Population, 1881..	1,920,000	1,359,000	7 : 5
Capital in Banks.	\$18,764,500	\$36,298,700	1 : 2
do. in Loan Cos.	\$28,028,625	\$2,870,821	10 : 1

It should be noted, however, that the Quebec banks do a large amount of their business and have a large amount of their stock held in Ontario, while the loan companies are strictly local.

XXII.

A SKETCH OF CANADIAN FINANCE.

BY JOHN McLENNAN.

In undertaking to write something about the revenue system of the Dominion and the Provinces, I must premise that Political Economy, although made the subject of systematic teaching, is as yet confessedly not reduced to a science, but is rather subject to the law, so well defined by Burke, that "circumstances give in reality to every political principle its distinguishing colour and discriminating effect." If I am not able to keep quite clear of what may be called politics, I shall try to avoid political partisanship.

Previously to the formation of the Dominion of Canada by the confederation of the Provinces, the moderate wants of the several governments were supplied by the proceeds of sales of the public lands, and of custom and excise duties, imposed chiefly with a view to revenue. It is true that in the Province of Canada (then comprising Quebec and Ontario) the question of protection to home industries had been discussed as an incident of the tariff, as in 1859, with the result of a liberal free list, as well as certain low rates on raw materials for manufacturing, on materials for ship-building, and on importations for the improvement of agriculture,—the general "unenumerated" rate being twenty per cent.

In 1866, in the flush of prosperity resulting from the demand in the United States, at the close of their civil war, for everything that the Provinces produced, a reduction was made to fif-

teen per cent. as the general rate; and that tariff was adopted in 1867 by the Confederation. The trade between the Provinces and the United States, which in the first year of the treaty of reciprocity amounted to \$33,482,754, had grown to \$84,070,595 in 1866, the thirteenth and last year of the treaty,—the exports of the Provinces being \$53,714,383 of the latter amount. Besides closing the reciprocity at that time, the United States adopted a very high tariff of customs, with the double object of paying off their war debt and of encouraging their manufacturers. The immediate consequence was the sharp limitation of a market for our productions,—our exports to all countries in 1868 being but \$57,567,888. This change had another consequence: it urged forward the confederation of the Provinces, for the object of increasing our interprovincial trade, and, at the same time, of uniting our resources to establish a highway to the seaboard.

The Intercolonial Railway is a work now fairly accomplished, at a cost of \$28,000,000 for the direct line, and of about \$12,000,000 for subsidiary lines. The next forward step may probably be said to be of yet greater importance to the future of the Dominion, viz., the acquisition of the Northwest Territory. For the growing expenditure, the revenue was soon found to be insufficient, and in 1874 an addition of two and a half per cent. was made to the general rate of the customs tariff. This, however, did not meet the want, and the yearly accounts continued to exhibit deficiencies. At the same time the course of our trade with the United States exhibited with yearly increasing force the disadvantage of our position with regard to them, arising from the difference between their tariff and ours, aggravated by the important circumstance of their superiority in numbers and resources, enabling their manufacturers to use Canada as a market for their surplus goods, to the utter ruin of our manufacturers who had on their side no foreign outlet. The general depression in the trade of both countries in 1876 and 1877 intensified the effect of this inequality, so that our importations for consumption from the United States in the latter year reached the value of \$51,312,669, as against our exports to that country of \$25,775,245,—the value of our importations from Great Britain being \$39,512,279, and our exports thither \$41,567,469.

It was in this state of things that, in the parliamentary session

of 1877, the leader of the opposition, Sir J. A. Macdonald, proposed a resolution, that "the house is of opinion that the deficiency in the revenue should be met by a diminution of expenditure, aided by such a readjustment of the tariff as would benefit and foster the agricultural, mining, and manufacturing interests of the Dominion." The motion was defeated by 119 votes against 70, but was brought forward again in the next session; and the subject was kept before the country in the press and in public meetings up to the time of the general elections in September, 1878. The contention was that with our geographical position, having on one side a people about ten times our number with a highly protective tariff, and on the other hand a wilderness, and with our way to the sea frozen for about half the year, our people must have some diversity of employment, besides the common one of agriculture; that from such industry they were debarred by the existing state of things, and that the remedy should be found in a tariff discriminating in the sense proposed, and rigidly administered.

The country accepted the argument and endorsed it by returning a majority of more than two to one to support it in the new parliament. The first business of that parliament in 1879 was to remodel the tariff in the direction promised. The result in the first full year of its application (1880), was the collection of a revenue averaging \$19.70 per cent. on all goods entered for consumption, as against \$14.03 per cent. in 1878, the last full year of the previous tariff. More than the estimated revenue was produced, and a surplus of 7,000,000 was available, in 1883, for the reduction of the public debt. Another expectation was realized. Instead of the great importation of manufactured goods from the United States, as in 1876 and 1877, the importations in 1880 fell to \$29,346,948. The Government decided in 1882 to go to the country, a year before the expiry of the term of parliament, and was met by the advocates of a purely revenue tariff with the contention as before, that the basis of the tariff was contrary to sound principle, and that its success was but accidental; but the Government was most fully sustained at the polls, and on the meeting of the new parliament, in 1883, proceeded to make some reductions in the tariff. The necessary consequence of the increase of home manufactures has been to diminish the imports; yet the

revenue up to the present time seems to be equal to the ordinary expenditure.

Meanwhile, the increase of manufactures in some lines, particularly in fabrics of cotton and wool, appears to have gone beyond the requirements of the country, and to have been attended by some disturbing influence upon labour, and some commercial depression. The opponents of the tariff argue that this is the natural and inevitable outcome of a system of protection, and they offer in proof the condition of the United States, where the weight of the manufacturing interest appears to prevent any relief from the pressure of a tariff that has gone beyond the requirements in both the objects proposed, viz., provision for the war debt and the fostering of home industries. It is to be borne in mind, however, that their tariff is more than 50 per cent. higher than ours, averaging, as it did last year, \$29.92 per cent. on all goods entered for consumption, while in Canada the average was but \$18.82 per cent.: or perhaps a more exact test is the average rate on dutiable goods, which in the United States was \$42.25 per cent., and in Canada \$25.82 per cent.

It must not be forgotten, however, that a system of protection, as is fully proved in the case of our neighbours, "grows by what it feeds on," and that it requires the watchful care of the controlling power. This is all the more necessary in our position, without any foreign market that we can reach with any surplus manufactures that may accumulate. The argument on which our system rests is what may be called the logic of circumstances, and we must guard against assuming that protection is a good thing absolutely and in all circumstances, any more than that free trade is a system applicable for good universally and in all circumstances.

The duties of excise are imposed in much the same manner as in Great Britain and the United States, on spirits, malt, and tobacco. In the case of tobacco, which is cultivated to some extent, the watchful care of parliament for the interests of its constituents is exhibited in the provision that the agriculturalist is not only permitted to use a certain quantity for each adult member of his family, but is allowed to sell a similar quantity free of duty to any buyer who is a consumer.

In a revenue derived altogether from imposts on trade a re-

markable exemption exists in the case of bank-note circulation, which, under the provision of the General Banking Act, supplies much the largest part of the currency of the country, free from duty in any form. The public has not derived a compensating benefit, for very serious losses have occurred, to note-holders as well as depositors, from the failures of banks,—losses the more serious because they have fallen in great measure on the poorer classes. At the same time the bank shareholders do not appear to derive any advantage. Without making a comparison with the profits of banking in Great Britain, where the large deposits of the money of the public furnish means for extraordinary profits, it is fair to make a comparison with banking in the United States. The capital of the national banks (2,197 in number), as reported in the American Almanac edited by the Librarian of Congress, amounted in 1882 to \$473,947,715, and their surplus to \$133,570,931, and after the payment to the national treasury of \$5,253,458 (a fraction over 1.10 per cent. on their capital), the shareholders received dividends amounting to an average of 8.73 per cent. (the tax on capital has now been remitted, but that on circulation remains), while I notice that the dividends of the last half-year paid by nineteen banks doing business in Quebec and Ontario, as reported on the Montreal Stock Exchange, average a rate of just 7 per cent. per annum. I venture to suggest that the duty remains for government to provide a reliable currency for the country. This might be made a source of public revenue, and would prove to be without damage to any private interest; on the other hand, the great temptation in the present currency system to unsound banking would be removed.

Turning from the particular manner of the imposition of duties to a view of the general revenue system of the Dominion and the Provinces, there are three things noticeable: 1st. The revenue for both services being derived almost exclusively from imposts on trade. 2nd. The absence of any tax on real or personal property. 3rd. The dependence of the provincial service on the federal treasury. There is indeed in the budget of the Provinces an item from sales of crown lands and timber; but, although there is hardly such a thing as reproduction of the forests, the receipts from both these sources are used as income. In Ontario and Quebec, there is a small amount from law stamps; and in

Nova Scotia, a sum from royalty on mines ; but the largest item in the revenue of each Province is a subsidy from the Dominion, and in the case of the smaller Provinces this is the greater part of the whole.

It is not a great while, since the idea was maintained in England that the owners of land were the proper, and ought to be the only, possessors of the power of legislation ; but, without going abroad for illustration, it is the fact that with ourselves the ownership or occupation of land is the chief basis of the electoral franchise, and yet it is just possible that under our revenue system there may exist a class of extremely economical freeholders (and voters) whose contributions would not by any reasonable computation entitle them to be represented as tax-makers. Waving, however, the question of such injustice, it is easy to see the cause in the state of dependence to which I have called attention, for the persistent agitation that we have seen in all the Provinces, resulting in demands on the federal treasury. It is difficult to foresee the end of these demands ; they are made on all sorts of pretexts, and even with no other pretext than that the money is needed. Two evils are apparent here : the friction that disturbs the federal relations, and the tendency to waste that comes of getting money merely by persistence in demanding it.

The remedy for these evils is, I venture to suggest, clear and simple : it is to establish for each Province, in lieu of all subsidy (and providing, of course, for the remission of an equal amount of federal taxation), a revenue independently of the federal government, by means of a tax on property, as is done in the United States under similar relations. Besides getting rid of a constant source of danger to the federal system, this change would bring the taxpayer into such direct relation with the provincial government as would lead to more care in expenditure, and more care in the machinery of government, for which there exists probable room and reason. I know that much argument, and high authorities can be quoted against direct taxation ; but I think the reasons I have given are sufficient warrant for imposing the very moderate amount required for provincial purposes.

Among ourselves a cry has been occasionally raised in the form of a warning against the alternative evils of bankruptcy or direct

taxation. The reader of English history will recall a cry that, not much over a hundred years ago, was strong enough to compel so firm and popular a minister as Sir Robert Walpole to abandon a proposed excise tax. It was denounced by such statesmen as Pulteney and Windham as "a monstrous project, such as struck terror into the minds of most gentlemen within this house, and of all men without doors," and it was added that "in all countries excises of all kinds are looked on as badges of slavery." The minister finally assured the house that he should not "be so mad as ever again to engage in anything that looked like an excise." Yet the likeness has been revived and has a permanent existence in Great Britain, in her Colonies, and in her giant offspring, the United States.

XXIII.

*WHAT MAKES THE RATE OF WAGES?**

BY EDWARD ATKINSON.

In the consideration of wages, a distinction must be made between the rate of wages which is stated in terms of money, and the absolute wages which induce the labourer to do the work,—such absolute wages consisting in what the money will buy, food, fuel, shelter, clothing, as well as the proportion saved for future use. Furthermore, when considering the question of wages, attention needs to be given to the proportion of the population of any given state or nation depending upon wages: that is to say, to the proportion of any given population in the position of the employed rather than that of the employer.

If we consider the annual product of this country as a unit or single subject of distribution, it will be apparent that this product, whatever its value may be, is converted into terms of money by bargain and sale, and is distributed among the people who consume it in greatest measure by way of wages. That is to say, the greater part is consumed by those who work for wages. The annual term fits the case, because the year represents one succession of seasons. A small part of the product of a previous year has been brought over to begin the work of the present year upon, and a small part of the present year's product

* Summary, read before the British Association, of a treatise bearing the above title, and included in a volume entitled "The Distribution of Products, or the Mechanism and the Metaphysics of Exchange."

is carried over to the next year to start the work of that year. Substantially, each year's subsistence depends upon each year's work. The world, and even the most civilized state in the world, is always within less than one year of starvation, never having a full year's product of food on hand at any one time, and so the most civilized nation is always within two or three years of becoming naked. In fact, the entire capital of the richest state—to wit, all the railroads, mills, works, warehouses, dwelling-houses, and goods and wares of every kind in existence—bears a market value not exceeding the value of two or, at the utmost, three years' product of the same state. Hence it follows that all profits, all wages, all taxes, are and must be derived from the market value of the annual product.

Now, the absolute law brought into action by the force of competition is this: In proportion to the increase of capital, profits diminish relatively, while wages increase absolutely. How can this principle be sustained? It is to this point that my attention has been given for many years. It is only lately that the requisite data have come into my hands on which an absolutely scientific proof of this law of diminishing profits and increasing wages can be given. The most complete proof will be found in the table, in which I have given both figures and graphical illustrations of the law.

A few words in explanation of this table. The founders of the cotton manufactories of this country, Messrs. Patrick T. Jackson, Francis C. and John Amory Lowell, Kirk Boott, George W. Lyman, Samuel Batchelder and others, were men of great foresight and business capacity. They proceeded cautiously, both in constructing their factories, in establishing the kind and quality of the goods to be made, and especially in the method of keeping accounts. Through the kindness of several of my friends, many of the earliest cost-sheets of some of the principal factories have come into my hands, from which records I have been able to take the actual days of labour, the sum of money paid, and the product, both in quantity and value. To these tables relating to the earlier years, I have been enabled to add the data of more recent years, from my own knowledge in the management of factories and by the kindness of others. From among these various tables, I have sorted the facts which are

contained in the foregoing statements. They are mainly taken from the records of two factories which have been continuously employed on one fabric. They cannot, however, be imputed to either of the two, and they do not disclose the actual results of the business of either corporation; but they are exactly consistent with the facts, and they show the general result more accurately than if the figures of a single factory had been taken. I have said that, by the force of competition, profits diminish and wages increase. That is to say, the competition of capital with capital works effectively in reducing the ratio of profit which the capitalist can secure from any given product, while on the other hand the competition of labourer with labourer utterly fails to reduce the rate of wages; but, on the contrary, in the face of such competition, the proportion of product falling to the labourers steadily increases. This seems to be a paradox, but an examination of the tables will show the simple reason.

Let the column on the right, the comparison of 1830 with 1834, be first considered. It required \$332,000 in money to construct the mill, with auxiliary buildings and dwelling houses of a factory of a little over 8,000 spindles. Such a mill would cost at this time less than one half as much; but, by taking the history of several separate factories which have never failed, and the stock of which has never been reduced, it appears that a sufficient proportion of the earnings has been set aside and expended in the increase of the productive units of the spindle and the loom, to the end that the ratio of dollars has been reduced 75 per cent., or from \$40 to \$10 per spindle. Each spindle of the greater number has become twenty-two per cent. more effective. Each spindle and each loom requires less arduous attention. The proportion of operatives per thousand spindles has been reduced sixty-four per cent., and the work of the lesser number is very much less severe now than the work of each of the larger number was at the beginning. The productive capacity of each of the operatives per day (the day of 1830 having been from thirteen to fourteen hours, and the day of 1884 being from ten to eleven hours) has increased 214 per cent. A part of the benefit of this vast change has gone to the consumers of the goods. The price of raw cotton happened to be almost exactly the same in 1840 as it was in 1833, and the standard sheeting was sold in 1840 at nine cents per yard and in

1883 at seven cents per yard, at which latter price it paid a fair profit. But the less price at which it can be sold to-day pays no profit whatever, the export demand for China having been interrupted by the French war, and the export demand for Africa having been interrupted by various causes.

Now, what has been the course of wages? The wages of the farmers' daughters of New England, to whom it was a privilege or profitable opportunity to enter the cotton mill in 1830, and to work there in 1840 from thirteen to fourteen hours per day, were \$164 a year in 1830, \$175 a year in 1840, and \$190 a year in 1850. In fact, the wages of women were much less than these figures show, as these figures give the average of men, women, and children, including overseers. Good weavers earned forty-eight to fifty cents per day only, in 1830 to 1840. The proportion of men was much greater, and of children much less, prior to 1850, than it is now.

Contrast these wages with the present. The average earnings of men, women, and children for the shorter hours are now \$290 a year. Skilful female weavers earn now more than male overseers and second hands earned in 1830. There is now some temporary disturbance, and there may be a temporary reduction in the rate of wages by the piece. But hard times are the best schoolmaster. If the rate of wages is reduced, improvement and invention will be applied to the machinery, and, in spite of present depression, the sum of wages for the year 1885, even at a less rate by the piece, will be higher than in the year 1884. In witness of this, turn to the column on the left, and see how the law of increasing wages has been progressing from 1830 to 1884, subject to the temporary aberration caused by the use of paper money, when wages apparently increased, but the cost of living increased a great deal more.

Now, what is the effect upon profits? Assuming that ten per cent. constituted such a rate of profit in 1830 as to have induced the construction of a factory, and that ten per cent. would be a high rate of profit at the present time; also bearing in mind that there is no factory known to me, nor do I believe one exists in New England, which has paid ten per cent. per annum, on the average, upon its original capital for a period of fifty years—we find that it required fourteen per cent. of the

gross sales to be set aside in the year 1840 at the rate of 1.18 cents per yard of cloth in order to secure to capital ten per cent. upon the investment. I will not go back to the earlier date of 1830, when it required a very much larger share of product to compensate capital at the rate of ten per cent. At the present time six per cent., or four tenths of a cent per yard, set aside from the sales annually will yield ten per cent. upon the capital.

There is scarcely an article which could serve so well as a guide and standard for this investigation as a standard sheeting. It has been made in the same way, of substantially the same weight, from the same stock from the beginning to the end, and the accounts have been kept in the same manner, according to the exact methods of account established by the careful men under whose supervision the mills were constructed. On this showing it is absolutely demonstrated that all the improvements and inventions of the last fifty years have gone to the benefit of the consumers of the goods and the operatives in the factory—in largest measure to the latter—while the share which has fallen to capital has diminished in forty years from fourteen per cent. of the gross product to six per cent. or less. In proof of these allegations I submit the table.

Now let me apply the principle which is sustained by these facts to the general subject of wages. It will be admitted by every one that if there is any branch of industry, either in agriculture, manufactures, mining, or mechanical work, which offers a fair expectation of ten per cent. on the investment, unless it be of some hazardous or dangerous kind, into that branch of work capital will flow in ample measure. Now, as a rule, in all the diverse arts and manufactures to which machinery is applied, taken as a whole, the gross value of the annual product is twice that of the capital invested. This is proved not only by the figures of the United States census, but by the extremely close figures of the Massachusetts census of 1875.

Now, if capital will rush into any branch of industry in which it can secure ten per cent., and if five per cent. of the product will yield ten per cent. upon the capital, it follows of necessity that the other ninety-five per cent. of the product must go to the labourers who do the work, because it cannot go anywhere

else. There are only two classes to whom the proceeds of sale can be devoted after these are paid, and those two classes are the capitalists and the labourers. If five parts of the product satisfy the capitalist so fully that new capital rushes in to compete for the opportunity of doing the work, then the other ninety-five parts must go to the labourer, or to the distributor. In my treatise, however, in order to be perfectly safe, I have assumed that ten parts of the annual product fall to the capitalist, and only ninety parts to the labourer, or to the distributor. Now, it appears that, in proportion to the increase of capital, the work of the labourer is rendered more effective, and his wages rise continuously, because he obtains a constantly increasing proportion of an increasing product. The more effective the capital, the less the number of persons needed for the work, and the larger the product. It therefore follows that any interference or retardation in the accumulation of capital, while it hurts the capitalist, harms the labourer a great deal more. It is therefore of the utmost importance to the labourer that justice should be done to capital—no more, no less.

If labourers receive ninety to ninety-five parts of all that is produced in one year, and cannot have any more without interfering with the accumulation of capital, and thereby diminishing the product of next year, they get all they can have, whether it be much or little, and their wages cannot be increased except by an increase of the general product. The general product can only be increased by the co-operation of more adequate capital with more skilful labour. It certainly cannot be increased by legislation, because legislation produces nothing. It can check production and reduce wages very materially, and meddling legislation generally works in that way.

What, then, are the facts in respect to wages in this country? The rate of wages is much higher in money than in any other country, and if subsistence be considered as a whole, the purchasing power of wages is greater for each dollar than in any other country. According to Mr. Wright's recent most valuable investigations, a dollar will buy less shelter and somewhat less clothing, but more food, than it will in England, and a dollar will buy more in England than it will anywhere on the continent of Europe. What makes the rate of wages in this country, and

why are they higher here than elsewhere? It is for this reason. By the co-operation of capital and labour intelligently applied to the greatest natural resources, the result of each year's work is a larger product of grain, cotton, machinery, timber, fabrics and wares, in ratio to the number of labourers employed, than can be attained anywhere else, and when the ninety or ninety-five per cent. of this huge product is converted into terms of money by sale, the resulting sum of money leaves for each person employed a larger amount than can be attained by the working people in any other country.

One of the great reasons for this, perhaps the paramount reason, is that this country is free from the burdens of passive war since slavery was abolished; free from the blood tax of a standing army, which takes at least ten parts in every one hundred produced on the continent of Europe; free from the burden of the artificial system of land tenure in Great Britain, under which the mass of the people has been deprived of land; free from the equally artificial system of the compulsory subdivision of land which controls most of the continental nations, under which allotments have become so small that effective machinery cannot be applied to it, whence it follows that the minimum of product results from the maximum of arduous labour; we are also free from the restrictions of caste and privilege. Now, when demagogues attempt to create antagonism between labour and capital by false statements, sensible and well-informed men and women will consider this matter, and will realize the fact that, even if their wages are low at the present time, they are yet progressively increasing and have increased steadily and regularly every year for the last fifty years, subject only to the inevitable chances and changes of short crops and commercial crises. Whatever the rate of wages may be, the sum of the wages or earnings of those who perform the work of production and distribution is ninety to ninety-five parts in one hundred of all that is produced.

I am unable to give facts as to the diminishing profits in other arts than the one I have named, but the increase of wages is well proved by the statistics of the census of Massachusetts and the census of the United States. I will give two examples in respect to two classes of work which require the services of a

high class of mechanics. In one large piano factory, the rate of wages of five classes of skilled workmen in 1843 was \$562 for the year; in 1880, for the same work, \$824 for the year. In another large piano factory, the wages of twelve classes of skilled workmen have been compiled, and the progress in rate has been as follows: 1853, \$11.32 per week, gold; 1860, \$12.33, gold; 1866, \$14.75 per week, currency; 1872, \$18 per week, currency; 1878, \$14.66 per week, substantially in gold; 1880, \$17.50 per week. At the present time, wages are as high in gold as they were in 1872 in currency. In one large establishment making table cutlery, eight classes of workmen averaged, in 1859, \$1.50 per day in gold. The same eight classes in 1880 averaged \$2.15 per day in gold. In another large establishment making edged tools, ten classes of workmen averaged in 1850, \$1.60 per day; in 1880, \$2.26 per day.

The processes of industry instanced have been carefully chosen, viz., standard cotton sheeting, pianos, table cutlery and edged tools, which have been affected in the least measure by the changes in the duties on the imports. With the exception of pianos, the other three subjects of investigation depend measurably upon the export trade, as well as upon the domestic consumption for the establishment of the rate of wages. This selection has been made in order that the subject might not be confused by considerations relating to the tariff. Finally, it appears that in the census for the year 1880 the population of the United States numbered a little over 50,000,000. I will disregard the fractions in the following statements. Of this population 17,400,000, in round figures, were found to be engaged in some sort of gainful occupation; the rest consisted of women who did the work of families, of retired persons and of children. Of this number, substantially 150,000 were employed in the service of the government, leaving 17,250,000 producers, who, by exchanging products with others, also obtained the means of living, and thereby became consumers. Of this number the census discloses the fact that 1,050,000 were employed in what may be called mental rather than manual work. They consisted of clergymen, lawyers, teachers, artists, chemists, engineers, officials of railroads, banks, and insurance companies, officials of manufacturing and other corporations, merchants, traders, and dealers. In this

list, capitalists living wholly upon the income of capital are not included. How many the capitalists number, the census does not disclose; but they are relatively very few, and their possessions represent but a relatively small part of the total wealth of the country, this wealth being more widely diffused, and enjoyed by a greater number of persons, than in any other country in the world. Deducting 1,050,000 of those engaged in gainful operations, we have the remainder 16,200,000 who constitute the actual working class, if the title of class may be rightly applied without offence in a scientific treatise. Seven millions of these were farmers and farm labourers; the rest, artisans, mechanics, clerks, salesmen, and saleswomen, laborers, factory operatives, domestic servants and other wage-earners. The proportion of employed to employers is at least fifteen to one. The rate of wages, which measures their share of the annual products, is therefore the paramount social question of the hour. If it can be measured, and if it can be found that, in the aggregate, their wages as a whole constitute from ninety to ninety-five per cent. of all that is produced, then all contention between labour and capital may well be laid aside, even by the most sentimental theorist who thinks he can build a world better than the Almighty.

It is of course a matter of immense difficulty to make such computation. By various ways, I think it may be considered to be substantially proved that the value of the annual product of the census year was the maximum \$10,000,000,000. In this computation, \$1,000,000,000 is included as the value of the domestic consumption on farms by farmers and labourers which never enters into the commercial statements, \$9,000,000,000 representing that part of the product which was bought, sold, and distributed. Five per cent., or \$45,000,000, is set aside from this sum to represent the profits of the capitalists as a distinct class. We will set aside \$40,000,000 as the maximum estimate of the small savings of industrious people, making a total set-aside for the maintenance and increase of the capital of the United States of \$900,000,000. I have assumed ten per cent. of a commercial product of \$9,000,000,000, as the maximum national profit which can be set aside for the maintenance or increase of capital. In the census year this would have been substantially at the rate

of \$18 per head of the population. If we apply this computation to the average population of the last thirty years, no sum of accumulated capital can be found in the United States corresponding to \$18 per head. It is a maximum estimate rather than a minimum. The remainder constitutes the earnings of all who are engaged in gainful occupations, amounting to \$8,100,000,000.

Now comes the main difficulty of ascertaining how the sum was subdivided. By various methods, I reached the conclusion that the average of each person engaged in the mental or administrative part of the work would amount to between \$1,000 and \$1,100, and that the next remainder to be subdivided among artisans, mechanics, farm labourers, domestic servants, and the like, would yield to each from \$400 to \$450. Having come to this conclusion by way of an estimate of the value of the total product, the proof in detail became necessary. The first standard is taken from the railroad. In the year 1880, one man out of every ten employed in any kind of gainful occupation aside from agriculture was employed in the construction or operation of a railroad. In the operation of a railroad every class is represented, from the highest paid official to the lowest paid workman who washes the floor of a station. The returns of a railroad are absolute, being taken from the books of the last previous financial year. From these returns, it appears that 418,957 men were employed upon the railroads of the United States in their operation, not including construction. The sum of their wages was \$195,350,000, averaging to each person for the year \$466. On subdividing this, it appeared that all those who were engaged in administration, or as general officers and clerks, earned \$1015 each, and that those who were engaged in the executive work, being ninety-five per cent. of the total number, earned \$450 each. It will be borne in mind that these are men, and that, in the remainder of the gainful occupations, the earnings of two and a half millions of women and children are included at less rates than the rates earned by men. By setting aside \$1050 to each person of the 1,050,000 engaged in the general work of administration, there remains for the rest, numbering 16,200,000, the sum of \$7,000,000,000 to be divided, which gives each one \$432. The total of all national, state and town taxation was over \$700,000,000 in 1880, or eight per cent. on the commercial products. Deduct

in proportion, and the net income of each workman is \$400. Each one of these persons, to whom \$400 a year is assigned on the average as the rate of his earnings, sustains substantially two others. It therefore follows that, if these wages are high as compared with other countries, as they are; or low as compared with what it would be desirable they should be,—they yet represent all that is produced that can be distributed among those who do the work. They represent an increasing share of an increasing product, which, under the law I have propounded, constantly falls to the labourer as years go on. This average is fully sustained by all the special reports of the census of the United States in which the wages or earnings of persons employed in all the different arts and manufactures are given, after adding to the apparent sums disclosed by the census such sum as seems fit in each case to carry the term of the census employment up to that of a full year.

What I have undertaken to prove, therefore, is that the law of competition carries to the capitalist a constantly diminishing ratio of profit from each year's product, and to the labourer a constantly increasing share. This rule was formulated by Bastiat many years ago in the following terms: "In proportion to the increase of capital, the absolute share of product falling to capital may be augmented, but the relative share is diminished, while on the other hand the share of the laborer is increased both absolutely and relatively." This rule attracted my attention very many years ago, and, throughout all the investigations I have made, I have endeavoured to ascertain the facts by means of which it can either be sustained or disproved. All the facts which I have been able to consider sustain the rule. The recent investigation made in England by Robert Giffen, of which I was informed about a year ago on my visit to that country, disclose the same sequences of diminishing rates of profit and increasing rates of wages, accompanied by increased purchasing power for every unit of wages, for the last fifty years of English history.

These big figures only confuse the minds of all persons who have not become accustomed to their use. Magnificent statements in regard to our national progress may, or may not, be sustained. If our national wealth has increased \$1,500,000,000 a year for twenty years, including the rise in the value of land,

what does it come to by the unit of the individual? One half, at least, is the increased value of land, the other half consists in added wealth, or \$750,000,000 a year; but this great sum if equally distributed would give less than \$20 a year to each person. What proportion of the people of this country have saved \$20 each year, or \$60 a year to each workman for twenty years? The average tax upon each person—combining national, state and municipal taxation—has been very nearly, if not quite, \$20 per head.

What proportion of this tax does each man, woman and child contribute? Have these taxes been paid by the same persons who have received the wealth? These are important questions, and each man who earns his daily bread by means of his daily work needs to have a definite answer to the following demand: "How soon, and in what way, do you, who are candidates for the places of highest influence, intend to relieve me of the heavy, and in a large measure useless, burden of taxation which finds me poor, keeps me poor, and leaves me poor; which takes from me all hope of saving, and deprives me of a part of the comforts and even of the necessities of life?"

There is no mercy in these statistics. By so much as some working men and women earn more than \$400 a year must some other working men and women earn less, if that is the measure of all there is; and, on what each \$400 will buy, three (or to be exact 2½) persons must be sustained. Shelter, subsistence and clothing for each person must be provided out of what \$146 a year, or forty cents per day, will pay for. It is appalling, but it is true. In order to increase this rate but five cents a day at the present time one thousand million dollars' worth of increased product must be made, and a market must be found for the increase.

Such a sum is twice the value of our wheat crop, ten times the value of our production of pig iron or of our wool clip, three times the value of our cotton crop, nearly twice the value of all our textile fabrics. To put it another way: in order that each wage earner may get fifteen cents a day higher wages, and that each person may have for home consumption what five cents more will buy, besides what he has now, we must add to our present product the equivalent of our present wheat crop, of our production of pig iron, and of all our textiles,—a sum total of \$1,050,-

000,000. This sum a year will give five cents a day to 58,000,000 persons, and no more. Yet, at this rate of forty cents a day on the average, the people of the United States are the most prosperous people in the world, because forty cents a day will buy more than it will in any other country.

I regret that I cannot give a more condensed statement of my theory, but this I cannot do without failing to show its true meaning or bearing on pending questions. The subject is of the utmost interest to anyone who cares to render the general struggle for life less arduous by permanent measures of true relief. It is a satisfaction to have happened to complete a long and arduous investigation just at the time when the facts are needed in order that political charlatans may be exposed, and the necessary attention given to the true science of politics.

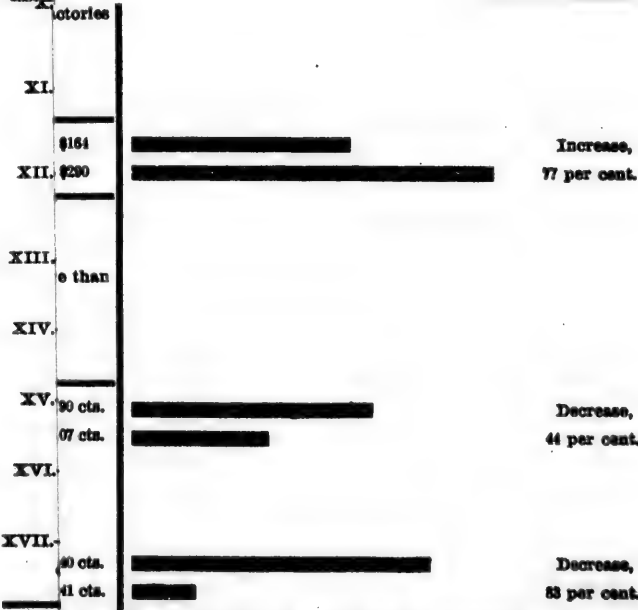
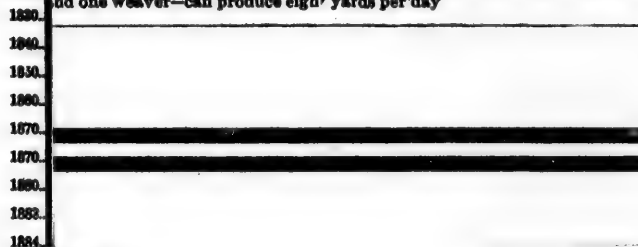
This average may seem incredible, but it must be remembered that it is an *average* only. It includes the whole negro population of the south, the two or three millions who dwell in the most primitive way in the southern mountain section, as well as the members of the families of all the small farmers of the east and west.

It is *inequality* in the wages of those who do the work of the world which calls for the attention both of the student and of the statesman, and inequality in what the wages will buy. Wholesale work, as it may be called, both in production and distribution, is done at the smallest fraction of charge—at low labour cost, but at high rates of wages to skilled workmen. It is the common labourer who suffers most, and it is retail distribution on which the highest charge is suffered. I may refer, in conclusion, to the bread problem, the investigation of which shows that the poor of Boston pay more for the distribution of bread after it is baked than it costs to raise the wheat of which the bread is made. But this subject opens another wide field upon which I may not now enter.

SH, WAGES INCREASE.

sheet, generated successfully and profitably since that date, mainly on standard figure of which the sole product has been a 36-inch standard sheeting. The

thern United States the people are still clad in homespun fabric. Five and one weaver—can produce eight yards per day



The inventories of other items constituting the materials form a very small part of the needs, a small measure only in respect to fuel and oil. other in the railroads less than an average of 5 per cent. of the capital invested, constation of their value even for very long distances. The cost of administra- increase cost of the goods, and in the general treatise of wages belongs in a class cent, 24 profits. The charge for selling the goods at wholesale does not exceed it. part of this is distributed among the clerks and salesmen who do the net sold 1.33 cent whole, and, second, in each department, it will appear that at the present year to be set aside from the sale of coarse cotton goods sufficient to cover 0.40 cent of the work, is less than 10 per cent. of the wholesale market value of the the share of the laborers who do the work both in respect to materials used goods d was a respect to the cotton factory that the value or proportion of capital to a ity if they other branch of industry. The proportion of capital to product being 4% per cent, according to the weight of the fabric and the quantity of cotton used. Buter hand, the ratio of capital product is about 1 to 15, therefore in the boot value, 10 of the gross sale needs to be set aside as profit on the business, to induce fuel, at selling cturers of New England are concerned, the average of capital to the Dollar capital to two dollars product; therefore three per cent of the gross Out of 100 per annum upon the capital invested in the buildings and machinery, plantal raw or half manufactured material into finished forms ready for final Compiled by EDWARD A. THIRSON, August, 1884.

THE LAW OF COMPETITION: IN ANY GIVEN PRODUCT, PROFITS DIMINISH, WAGES INCREASE.

The following deductions have been made from the accounts of two New England Cotton Factories, both constructed prior to 1880, and operated successfully and profitably since that date, mainly on standard sheetings and shirtings—No. 14 yarn. The figures given, from 1841 to 1884 inclusive, are absolute, being taken from the official accounts of mills, of which the said product has been a 34-inch standard sheeting. The figures of 1884 are deduced from a comparison of the data of two mills. The figures of 1884 are deduced from a comparison of the data of two mills. The figures of 1884 are deduced from a comparison of the data of two mills.

WAGES PER OPERATIVE PER YEAR.

1841.	\$64. gold.	
1842.	175. gold.	
1843.	190. gold.	
1844.	197. cur.	
1845.	275. cur.	
1846.	348. gold.	
1847.	360. gold.	
1848.	367. gold.	
1849.	380. gold.	

PROFIT PER YARD NECESSARY TO BE SET ASIDE IN ORDER TO PAY 10 PER CENT. ON CAPITAL USED.

1841.	3.40c. gold.	
1842.	1.121 gold.	
1843.	1.110 gold.	
1844.	.886 gold.	
1845.	.790 cur.	
1846.	.660 gold.	
1847.	.611 gold.	
1848.	.611 gold.	
1849.	.612 gold.	

YARDS PER OPERATIVE PER YEAR.

1841.	4,353	
1842.	5,087	
1843.	12,144	
1844.	21,791	
1845.	19,388	
1846.	20,000	
1847.	20,343	
1848.	22,023	

Changes in the machinery affected production.

In the mountain section of the southern United States the people are still clad in homespun fabric. Five women—two carders, two spinners and one weaver—can produce eight yards per day.

Product of per- son 1 year in No. Carolina.	300 yds.
Product of 1 per- son in New England.	10,000 yds.
Wages in New England at 1 cent 100ths of a yr.	\$100.00
Wages in No. Car- olina at 1 cent 100ths of a yr.	\$1.00
Cost in No. Car- olina at 1 cent 100ths of a yr.	\$1.00
Cost in No. Car- olina at 1 cent 100ths of a yr.	\$1.00

COST OF LABOR PER YARD.

1841.	1.500 gold.	
1842.	1.200 gold.	
1843.	1.040 gold.	
1844.	.900 gold.	
1845.	1.030 cur.	
1846.	1.340 gold.	
1847.	.900 gold.	
1848.	1.000 gold.	
1849.	1.070 gold.	

COMPARISON OF 1840 WITH 1884-4.

This comparison will not show the full reduction in the cost of labor per yard which may be expected in 1884, because changes have been in progress which, when completed, will increase the capacity of the mill about 10 per cent., and it is a well understood rule that, while such changes are being made, the current work of production is done at a disadvantage.

I.—Capital.	1840	\$100,000		1884	\$100,000	Same.
II.—Fixed capital.	1840	\$100,000		1884	\$100,000	Same.
III.—Active capital.	1840	\$100,000		1884	\$100,000	Same.
IV.—Spindles.	1840	12,000		1884	30,024	Increase, 149 per cent.
V.—Looms.	1840	400		1884	1,000	Increase, 150 per cent.
VI.—Fixed capital per spindle.	1840	\$8.33		1884	\$3.33	Decrease, 57 per cent.
VII.—No. of opera- tives emp.	1840	100		1884	207	Same.
VIII.—Operatives per 100 spindles.	1840	8 1/3		1884	17 5/10	Decrease, 50 per cent.
IX.—Lbs. per spin- dle per day.	1840	0.50		1884	0.50	Increase, 25 per cent.
X.—Lbs. per opera- tive per day.	1840	50		1884	100	Increase, 100 per cent.
XI.—Hours work per day.	1840	11		1884	11	Decrease, 15 per cent.
XII.—Lbs. per opera- tive per hour.	1840	0.23		1884	0.23	Increase, 50 per cent.
XIII.—Wages per op- erative per yr.	1840	\$175		1884	\$367	Increase, 61 per cent.
XIV.—Wages per op- erative per hr.	1840	4.00 cts.		1884	3.00 cts.	Increase, 50 per cent.
XV.—Wages per op- erative per yr.	1840	1.00 cts.		1884	1.00 cts.	Decrease, 61 per cent.
XVI.—Profit per yr. 10 % on capital.	1840	1.10 cts.		1884	0.40 cts.	Decrease, 60 per cent.
XVII.—Price of goods, cost cotton man.	1840	2.04 cts.		1884	2.04 cts.	Decrease, 51 per cent.

The rule of diminishing rates of profit and increasing rate of wages, of necessity resulting from the progress of invention, is fully sustained by these tables. As the capital is increased both in the quantity and in the obsolescence, the absolute share of product falling to capital is increased, but the relative share is diminished. On the other hand, the share of the laborer is increased, both absolutely and relatively. Labor takes of necessity a constantly increasing proportion of an increasing product. In this example, the wages of the operatives have increased since 1840 100 per cent. per day and 50 per cent. per hour. Since 1840, 77 per cent. per day and 149 per cent. per hour. High wages in money have seemed as the necessary result of the low cost of labor.

It will be observed that in 1840 the price of standard sheeting being 9 cents a yard it required 1.18 cents to be set aside for profit, or 13 per cent. of the price, in order to pay 10 per cent. upon the capital. Next it required 1.10 cents to be set aside, being 10 per cent. of the whole price to pay wages at the average rate of only 100 a year to each operative. In 1884, the price being 2 cents a yard, it required less than 6 per cent. of the gross sales, 4.00 cents a yard, to be set aside in order to pay 10 per cent. upon the capital, while 1.00 cent. being set aside as the share of labor, or a fraction over 5 per cent. of the gross sales, yielded to the operative 100 a year. The goods cannot now be sold at 7 cents a yard, and there is little or no profit for the time being. But with wages per operative a moderate rate of profit in 1840 it is an excessive rate in 1884. The business would stand with great rapidity if there were a solid 7 cents a yard to be set aside upon the capital of a quarter of a cent a yard and less than 40 per cent. of the gross amount of sales.

But it may be said, having assigned 6 cents to profit, and 1.00 cent. to labor out of 7 cents a yard gross value, there remains 1 cent a yard to be accounted for. This of course represents the money cost of oil, fuel, water, oil, repairs, taxes, cost of administration, transportation of the goods to market and the cost of selling them at wholesale.

Does this all go to labor, or is there also a profit to be set aside on these elements?

Our space would not suffice to treat each one of these elements but it may be said. First, the cotton is not exclusively all labor; there is no large margin of profit at the present time in raising cotton which is mainly pro-

COMPARISON OF 1830 WITH 1884.

In this comparison the statements are based in part upon the figures of each mill. Both appear to have cost about \$40 per spindle, including dwellings for operatives. More than one kind of goods were made in each for a time, but the figures have been adjusted to standard sheetings, an average having been computed by the yard and pound.

Fixed capital.	1830	\$102,000		1884	\$100,000	Decrease, 2.7 per cent.
Spindles.	1830	1,100		1884	30,024	Increase, 266 per cent.
Fixed capital per spindle.	1830	\$92.73		1884	\$3.33	Decrease, 95 per cent.
Operatives per 100 spindles.	1830	40		1884	17 5/10	Decrease, 54 per cent.
Pounds per operative per day.	1830	0.94		1884	0.23	Increase, 314 per cent.
The hours of labor in most of the factories in 1884 were 14 per day.						
Wages per operative per year.	1830	\$164		1884	\$360	Increase, 77 per cent.
The wages per hour in 1884 are more than double those of 1830.						
Wages per yard.	1830	1.80 cts.		1884	1.00 cts.	Decrease, 44 per cent.
Profit per yard at 10 per cent. on capital.	1830	1.00 cts.		1884	.41 cts.	Decrease, 59 per cent.

duced by small farmers. Second, the other items constituting the materials form a very small part of the total cost and are subjected to profits in small measure only in respect to fuel and oil.

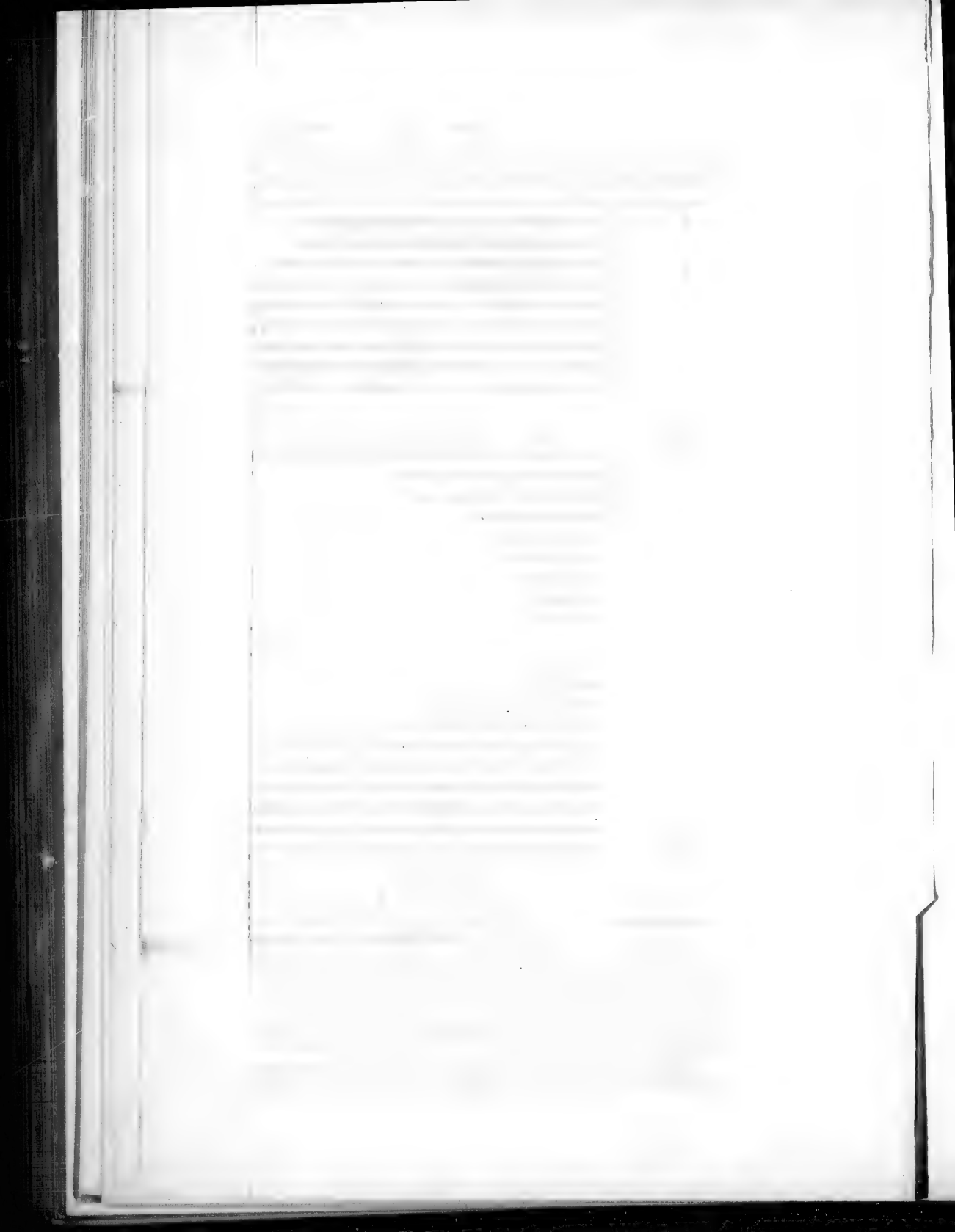
The cost of transportation yields to the railroads less than an average of 5 per cent. of the capital invested, and cotton fabric pay but a small fraction of their value even for very long distances. The cost of administration constitutes a very small part of the cost of the goods, and in the general creation of wages belongs in a class by itself rather than to be considered as profit. This charge for selling the goods at wholesale does not exceed 1 per cent. to 1 1/2 per cent., and a large part of this is distributed among the clerks and salesmen who do the work.

If the subject be analyzed, first, as a whole, and, second, in each department, it will appear that at the present time the proportion of profit which can be set aside from the sale of cotton goods is not sufficient to cover profits in all the various departments of the work, is less than 10 per cent. of the wholesale market value of the product and 20 per cent. in the absolute share of the laborer who do the work both in respect to materials used and in the finished product.

It is also necessary to remember in respect to the cotton factory that the value or proportion of capital to a given product is greater than almost any other branch of industry. The proportion of capital to profit being of capital to each \$1 or \$1.50 of product, according to the weight of the fabric and the quantity of cotton used. In the cost and shoe factory, on the other hand, the ratio of capital to profit is about 1 to 10, therefore in the best and show business a much less proportion of the gross sale needs to be set aside as profit on the business, to induce the sale.

On the whole, so far as the manufacturers of New England are concerned, the average of capital to the gross value of the products is not double capital to two dollars product; therefore three per cent. of the gross sales set aside as profit will yield six per cent. per annum upon the capital invested in the buildings and machinery which are applied to the conversion of raw or half-manufactured material into finished forms ready for final consumption.

Compiled by EDWARD A. FLETCHER, Bangor, Me.



XXIV.

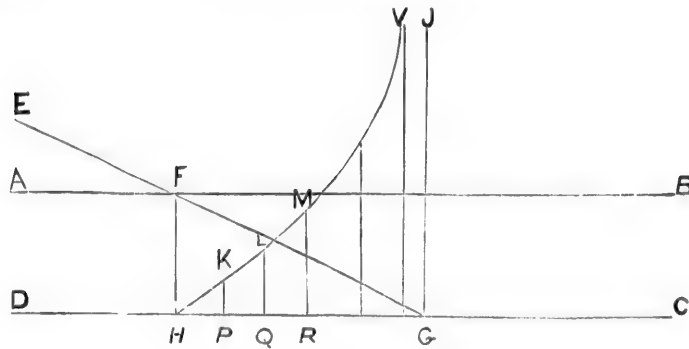
HARMONIES AND ANTAGONISMS IN THE SOCIAL FORCES.

BY W. A. DOUGLASS.

Some writers on the Science of Economics have endeavoured to prove that all the social forces are harmonious. Others seem to have assumed this to be the case, for most of their explanations are based upon this assumption. It is my purpose to point out that there are certain antagonisms; and I undertake this all the more readily, as it opens up some questions of the most interesting and important character.

Most of our standard text-books teach that the essential characteristic of wealth is exchange value: add exchange value to any commodity, and it becomes wealth; remove exchange value, and it ceases to be wealth. A slight examination will show that this definition is attended with certain serious difficulties.

In the diagram that follows, let *FH* represent the quantity of water necessary to supply a certain community, so that as long as it maintains the level, *AB*, it can be obtained without toil. Let the quantity vary and the variation be represented by *EG*. From *E* to *F* there is superabundance, from *G* to *F* deficiency, at *G* the quantity is zero. From *E* to *F* there is no exchange value, at *F* value begins, from *F* to *G* value increases, at *G* value is infinite. Let *KP*, *LQ*, *MR*, etc., represent the varying values. These would form the curve, *HV*. Here we may observe *three circumstances*, concurrent and dependent, viz., as scarcity increases, toil increases, and value increases.



Now wealth* may vary in quantity, it may be more or less. It is therefore capable of measurement. What shall be the standard? I take it that the standard must be one of two things, either value or quantity. If we assume value, then we meet these difficulties, as shown above; when we diminish the stock from the point, *F*, towards *G*, we add value, and when wealth is reduced to zero, value is infinite. Value, therefore, cannot be the standard. If, on the contrary, we assume quantity to be the standard, we meet no such difficulties. In fact, I do not remember a writer on Economics who does not accept the doctrine, that we are wealthier as we increase our satisfactions and diminish our toils. And, according to this, we are, *a fortiori* wealthiest of all, when we have eliminated toil altogether. But when toil is eliminated, value is eliminated; therefore we should call water, air, sunshine and similar satisfactions, wealth, even though they are utterly void of exchange value.

It is true that, in the same language of commerce, values alone can be matters of exchange, and therefore only commodities having exchange value are spoken of. In our struggle with each other, it is our constant endeavour to obtain ever increasing command over the services of our fellows: our selfishness would lead us to impose more toil. But in our contest with nature we are just as strenuously endeavouring to diminish toil by imposing our burdens on the physical forces.

Commercial wealth must have exchange value, but satisfaction obtained without toil, and therefore without value, should be equally called wealth; otherwise we teach that we are producing

wealth when we are becoming poorer, and hence make wealth and poverty synonymous.

I have made this analysis for two reasons: first, in order to show that, if we are to have logical consistency in the Science, we must abandon the standard definition which makes wealth depend on exchange value; and secondly, because all my subsequent reasoning is based upon the assumption that wealth is to be measured by quantity and not by value. I would define wealth to be "beneficent satisfactions," and then divide it into two classes, *non-exchangeable* and *exchangeable*,—the latter alone having value.

That we may get a better conception of the antagonisms to which I wish more particularly to call attention, let me first point out some of the harmonies to be found in the economic forces.

The carpenter, by devoting attention to one pursuit, develops special skill, accumulates special tools, and acquires special knowledge. Consequently, with less toil, his product is greater in quantity, and of much better quality, than it otherwise would be. The same is true of the blacksmith. When, therefore, the carpenter and blacksmith exchange their wares, they both obtain a greater quantity than if they had worked, not at separate trades, but at every trade indifferently. In this kind of exchange we find mutual enrichment. If it happens that one of these trades is more profitable than the other, this greater profit tends to attract competition. There is thus a tendency to equality of reward. Then again, should one trade be more burdensome than the other, this excess of burden repels competition. There is thus a tendency to equality of burden. Here are shown to be *three harmonies*: Mutual Enrichment, Equality of Reward, Equality of Burden.

It will be noticed that these tendencies can operate only in the absence of restraint, where men are free to exchange their products or to choose whichever pursuit they prefer without any interference from government, trades unions, or other sources. And in general the methods adopted in production, viz., working at the best time, in the best manner, with the best implements, and in the best situation, are all in accord with the public weal and may be pronounced harmonious.

There is, however, another class of exchanges which present a

very striking contrast to the preceding. A few years ago on this continent, fuel, especially in the form of wood, was so abundant that it could be obtained in the forests for nothing. Two factors have operated to change the value: the quantity has diminished, and population has increased. The ratio of fuel to population is much less than formerly, and consequently, the public are much poorer in this commodity. At the same time, owing to the increased price of fuel, the owners of forests and mines have become much wealthier. Here, we notice a movement, not of mutual enrichment, but of impoverishment on one side and enrichment on the other. In the case of the carpenter and the blacksmith exchanging, each gives more; hence each receives more, and therefore each is enriched. In the case of the holders of such a natural product as fuel, there is less to distribute; hence comes impoverishment to the purchasers, while the owners receive enhanced prices, and therefore they become richer. Here the enrichment is not mutual, but one-sided only.

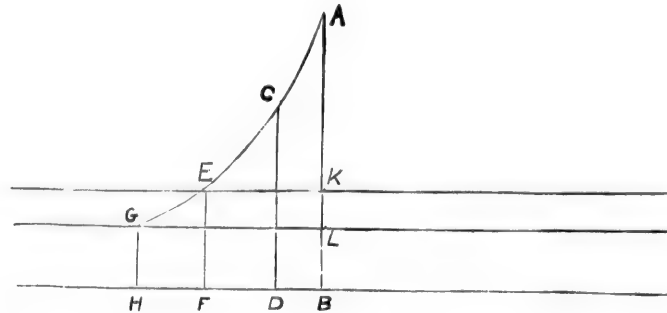
The same *antagonism* follows in the case of all, or nearly all, those natural commodities which have been appropriated by individuals; and, of these commodities by far the most important is land. The land on the face of the globe, including its rich supplies of minerals, is a fixed quantity incapable of increase. Let the population increase and, as in the case of fuel, the portion available for each is less; therefore, society is poorer in land, while values rise and landowners are richer.

But this tendency is intensified by another circumstance. Improved organization of labour, together with improved mechanism and increased knowledge, has increased the productiveness of labour in a remarkable degree. Increased production means increased competition in selling, and therefore diminished prices. On the other hand the competition in the sale of land, fuel, and similar commodities is diminished. We have, therefore, a *second antagonism*: increased competition against diminished competition, and therefore diminished reward against increased reward.

If we accept the doctrine that increased population compels resort to inferior sources of supply, (and, with certain limitations, I do not think this doctrine can be gainsaid), then increased population means increased impoverishment in some directions. But at the same time this resort to less fertile soils compels an

increased rent for all lands that yield a surplus over those cultivated at a minimum of fertility. This means increased ground-rent encroaching on the wages fund. This movement is a double calamity; it means that, out of a diminished return, a larger portion must be yielded up as rent.

A diagram will make this clearer.



Let AB , CD , EF , GH , represent the productiveness of different lots of land, AB , the centre of some great city, and EF , the poorest land cultivated. EF marks the height of the wage fund of unskilled labor. If $ABFE$ represent the whole product, then AKE will be taken as rent, leaving $EFBK$ for wages. Let population increase so that poorer soils are taken into cultivation, GH being the limit, then $ABHG$ will be the gross product. But since poorer lands are used, average product is diminished; and rent takes ALG , leaving for wages $GHBL$. The wage fund was sunk from EF to GH . Here not only has the average return diminished, but out of that return a smaller portion is left for the labourer.

The deduction just made indicates that exchanges are of two kinds, viz., harmonious, and antagonistic. In the first there is service for service, toil for toil, and tendencies to equality of reward and equality of burden. In the second there are service and toil on one side only, idleness on the other. The tendencies are toward inequality: to impoverishment on one side, to enrichment on the other. The antagonism is against the toiler and in favour of the idler.

Of all the problems presented to the students of Economics, I regard the following as the most important:—Why is it that society is divided into two parts, one portion of which must toil to supply not only its own wants, but also the wants of the other; and why is it that the toilers must be satisfied with the smaller share? Or, the question may be put thus: Why are the producers not the possessors? It is, I think, in the investigation of the foregoing antagonisms, that we must look for the answer to these queries.

From this investigation two lessons may be learned:—1st. In determining the incidence of taxation, the method most in vogue among the majority of nations is to try and get between the harmonious exchanges, such as that of the carpenter and the blacksmith, in order to collect, not merely enough for strictly governmental purposes, but to impose penalties so heavy as to destroy the advantage of the exchange. It would not be difficult to find from the history, either of the past or the present, instances in which taxes excessively onerous have been imposed in such a manner as to render these antagonisms more intense. 2nd. The position of Canada is at present phenomenal. We have a vast tract of unsettled territory of unsurpassed fertility, abounding in coals and other minerals. We are now laying the foundations of empire. Our actions to-day must affect the fate of millions. By planning wisely, before society is formed and crystallized, we may arrange its forces so that these antagonisms may be minimized. Our opportunity is grand; but unless we cry a halt very soon, that opportunity will have passed away never to return.

XXV.

*THE HISTORY AND CONDITION OF EDUCATION
IN THE PROVINCE OF MANITOBA.*

BY REV. GEORGE BRYCE.

I. THE BEGINNINGS OF EDUCATION.

The colony founded by the Earl of Selkirk in 1812, on the banks of the Red River of the North, was the nucleus of the Province of Manitoba. It was a part of the plan of the noble founder to provide for his people full educational and religious advantages. He recognized, on his visit to Red River in 1817, the need of these opportunities for Protestants and Catholics alike. On the Earl of Selkirk's return to England he took steps to provide his colonists with the promised facilities. Before going to France in 1819, (whither indeed he went to die), he gave orders for the despatch of a Protestant clergyman to the English-speaking part of his colony, having previously set apart land for a church and schools. In 1820, the Scottish settlers had erected a school house which served alike for religious and educational purposes. This was built upon a site now included within the limits of the City of Winnipeg.

Not earlier in design, though earlier in execution, was the purpose of Lord Selkirk to provide for service and teaching among

NOTE.—The following educational papers, though not prepared in time for the meeting in September, 1884, are here printed as forming part of the original programme of the Committee on Canadian Enonomies. The Committee regret that they have found it impossible to procure a paper on education from the Maritime Provinces.

his Roman Catholic colonists. Through his efforts in Montreal, a distinguished French Canadian priest, known afterwards as Bishop Provencher, journeyed to Red River. As early as 1818, the Roman Catholic Mission at St. Boniface, on Red River opposite Winnipeg, was begun, and beside it rose a school. At this school, shortly after, we are told, there were pupils in the Humanities. The Catholic Church has confined its attention chiefly to the Indians, and the Indian half-breeds of French origin. Schools and convents have been erected, and maintained in a considerable number of places throughout Manitoba and the Northwest Territories. The school at St. Boniface has now become the College of St. Boniface.

In the year 1835, the Red River settlement was organized under the name of "The District of Assiniboia." The Territory was placed under the rule of a Council appointed by the Hudson's Bay Company. There seems to have been no public provision for schools made by this Government. Each church erected had by its side a school under the control of the missionary. There was no system of taxation in vogue, but the school was sustained by private subscription, or by grants from the Missionary Societies in England. In the District of Assiniboia, in 1870, there were, in all, some 12,000 people, viz., 5,000 French half-breeds, 5,000 English-speaking half-breeds (largely of Orcadian descent), and 2,000 Whites. The population of different origins seems to have segregated into parishes. In the French half-breed parishes a few schools were found. In 1870, there were fourteen schools in the English speaking half-breeds' parishes under the Church of England, and two schools under the Presbyterian Church in the parishes belonging to the White descendants of the original Selkirk colonists.

As early as 1833, a higher school was established which existed in various forms, with varying fortune, until in 1855 it became St. John's College. The present Bishop of Rupert's Land placed this institution on a new footing in 1866.

Just as the rule of the Hudson's Bay Company was passing away, the Scottish Selkirk colony, with the help of Canadian friends, took steps towards the founding of a college. Thus, third in time of the colleges in the country, Manitoba College was begun in 1871.

II. FIRST PUBLIC SCHOOL LAW.

The establishment of a government by the Dominion of Canada, in the newly created Province of Manitoba, took place in the year 1871. In that year, at the first meeting of its Legislature, the Province obtained its first School Act, the germ of the present law. The leading provisions of this Act were as follows:—

1. That a joint Board, half Protestant, the other half Catholic, should have control of Common School Education.

2. The management of the Protestant Schools was given entirely to the Protestant section; that of the Catholic Schools, to the Catholic section.

3. The formation of School Districts was effected by the Board, with the approval of the Governor-in-Council.

4. The mode of Support of the school, whether by private subscription or taxation, was left to be decided by each district.

5. The Examination and Licensing of its Teachers belonged to each section.

6. A Government Grant was given to the board and divided proportionally between the two sections; and, after the payment by each section of a sum not exceeding \$600 to the Secretary or Superintendent of Schools, the amount belonging to each section was to be divided amongst its schools.

The system thus founded was much developed in an Act passed in 1873. This gave the power to any ratepayer to choose the school he wished to support, whether Catholic or Protestant. The duties of all officers were defined; taxation was made compulsory, and machinery established for collecting taxes.

A very considerable discussion arose about this time as to the advisability of having Protestant and Catholic schools as such. It seemed, however, as if the legislation of the Dominion Parliament, in constituting Manitoba, had protected the minority in preserving for them separate schools. The Province has now virtually accepted the principle of division, although it may be stated that, from the Protestant immigration having largely predominated, and from almost all the Catholics having been French-speaking and living together, the Protestant schools have really taken rank as National Schools,—the Protestant population bearing a proportion of eight to one to the Catholic minority.

In 1876, a considerable modification of the School Law took place in the new Act passed in that year relating to cities and towns. From this amended Act of 1876, the prosperity of the National School system in Manitoba may be said to have sprung. It enabled the cities and towns to establish good schools, and thus acted beneficially on all the schools of the Province. Provision was made of a more perfect kind by this Act for the issue of debentures by school districts, thus enabling them to erect suitable school buildings. The Acts have been amended and extended in the years 1882, 1883, and 1884, but the Act of 1876 was the virtual establishment of the present form of school provision.

III. PRESENT ORGANIZATION.

Each section of the Board of Education has a chief officer for the administration of its schools. Such chief officers must be members of the Board of Education. This Board now consists of twelve Protestants and nine Catholics, but these two sections act in almost all matters independently. Their only joint function of importance is to make regulations for registering and reporting daily attendance at the schools. The members of the Board selected from the two sections as chief officers are chosen by the Government, and appointed by the Governor-in-Council. Their duties are to act as Secretaries to the Board, and each individually to their own section; to call school meetings if necessary; to see that the law is carried out by trustees and teachers; to supervise the inspectors; to explain the law; collect and tabulate statistics; and to report to the Government. The chief officer of the Protestant schools is called "Superintendent of the Protestant Schools."

The Board of Education is the supreme authority in public school education. The Superintendents are regarded as the executive officers of the Board, and each is bound in everything to carry out the directions of his section.

As already stated, the Governor-in-Council appoints the Board, with its two sections; one third of each section retires every year, and the Government appoints their successors. The functions of the Board, as given in the first Act of 1871, are very much those of the Board at present. The Protestant schools are super-

vised by Inspectors acting under the Superintendent, so far as the Public Schools are concerned. The Secondary Schools are simply higher departments of the Public Schools. Two members of the Board of Education are appointed as Inspectors of the Collegiate departments. For the ordinary school inspectors, of whom there are nineteen under the Protestant section, and five under the Catholic section in the Province, the territory is mapped out into divisions by their respective sections. The inspectors belong to two classes. First, there are those appointed by the Board of Trustees in cities and towns for their schools. In Winnipeg, such officer devotes his whole time to the inspectorship, and is the executive officer of the Board. His appointment must be approved by the Board of Education. For the school divisions outside of cities and towns, inspectors are appointed by the section of the Board of Education. At one time the Inspectors in cities and towns were required to be University graduates. This requirement is now dispensed with. As a rule, the inspectors are clergymen in the several localities. Their duty is to visit each school of their jurisdiction twice in the year, collect returns, make out reports, and act in the adjustment of Union school districts embracing portions of two or more municipalities. The only schools recognized by the law are Public Schools. The Secondary Schools are simply the two highest standards of the twelve laid down for Public Schools in cities and towns. Schools in which Standards I to X are taught, are simply Public Schools. The trustees elected by the people have control of Public and Secondary Schools alike.

Provision is made by the law for the establishment of local Boards of Trustees having certain defined portions of territory allotted to them. The territory is determined by the Municipal Council within whose limits the school is to be begun. In order to obtain the establishment of a school, a petition embodying certain information must be forwarded to the Municipal Council. Such petition must be signed by at least five resident heads of families. The Council may grant or refuse the school. The territory set apart for its support when a school is established, is called a "School District." There is no fixed amount of area for it. The law requires, however, that every school district shall have at least ten children, between five and fifteen years old, resident

within three miles of the school site. For the purpose of defining the territory of school districts not lying in one municipality, the two or more reeves of the interested municipalities and the local inspector constitute a Board to deal with the matter. An appeal lies from the Council's action in case of dissatisfaction to the section of the Board of Education to which the school belongs.

The first meeting of the people in a school district consists of the resident freeholders and householders. After the first meeting, the electorate consists of ratepayers only. In cities, twelve ratepayers are elected as a Board of Trustees; in towns, the number varies according to the number of wards; in towns not divided into wards and in country districts, there is a Board of three. A portion of the Board retires every year, and its successors are elected annually.

For the purpose of supplementing the Legislative Grant to any school, the Board of Trustees lays before the Municipal Council to which it belongs an estimate of the amount required for the year. The Municipal Council is bound, whether the amount has been collected or not, to hand over in semi-annual portions the amount thus demanded. The Trustees may do whatever they judge expedient with regard to building, repairing, renting, warming, furnishing, and keeping in repair, the school buildings of the district. For the purchase of school sites, and the erection of school houses or teachers' residences, the ratepayers of any school district may require the Trustees to borrow money by debentures. Applications for this purpose must be certified by the Lieutenant-Governor-in-Council. Minute regulations are in force as to the form of debenture and the proceedings needing to be taken for its ratification.

The Trustees may contract with and employ teachers who possess the necessary certificate from the Board of Education. The Trustees have to see the discipline of the schools in their care properly enforced, and to hold meetings to listen to complaints made by teachers or parents.

The Education Acts provide for the compulsory attendance at school of children between the ages of seven and twelve. Any Board of Trustees may, on obtaining the sanction of the section of the Board of Education to which it belongs, have the Act in this respect put into force. So far, however, as the writer is

aware, no Board of Trustees has availed itself of the power given by this portion of the Act.

IV. TEACHERS.

There are two kinds of certificates given by the section of the Board of Education, viz., Collegiate and Public School certificates. The former are given to graduates of Universities in Her Majesty's dominions, who present evidence of good moral character, and of their knowledge of the science of education and the art of teaching. Public School certificates are of three classes, each class having two grades. These certificates are given as the result of a written examination held annually in August.

First Class.—The subjects are: Reading, Spelling, English Grammar, Composition, Writing, Geography, History (Greece, Rome, Modern Europe, England, and Canada), School Organization and Management, Book-keeping, Arithmetic, Algebra, (Colenso Part I), Euclid (Books I, II, III, IV, VI, and definitions of V), Mensuration, English Literature, Elementary Statics, Hydrostatics and Physics, Physiology, Botany, and Inorganic Chemistry. To obtain First class, Grade A, a candidate must gain sixty-seven per cent. of the aggregate marks on the subjects, and forty per cent. on each. For First class, Grade B, there is required forty per cent. of the aggregate marks, and twenty-five per cent. of each. In order to obtain a Professional certificate of the First class, good until recalled, a candidate must present evidence of Normal School training, and of having taught one year. Candidates passing the examination, unable to furnish evidence of training and experience, may obtain a Non-professional First-class certificate good for two years.

Second Class.—The subjects are: Reading, Spelling, Composition, Writing, Geography, School Organization and Management, and Arithmetic as for First class, Modern, English, and Canadian History, Grammar (Analysis and Parsing), Algebra (to the end of Simple Equations), Euclid (Books I and II). To obtain a Professional Second-class certificate a candidate must have passed the examination and have received Normal School training. Non-professional Second-class certificates are given for one year, on the examination being passed. Grades A and B in this class

are granted on the same percentage of marks as in the First class. An Honour student passing the Previous Examination of Manitoba University obtains *ipso facto* a Non-professional Second-class certificate, Grade A; and a Passman of the same standing, a Non-professional Second-class certificate, Grade B.

Third Class.—The subjects are: Reading, Spelling, Grammar (Analysis and Parsing), Composition, Writing, Geography of Europe and America, History (English and Canadian), Arithmetic (to Percentage), School Organization. Grades A and B in this class are given on the same percentage as in the other classes. To obtain a Third-class Professional certificate, Grade A, good for four years, a candidate must have Normal School training. Non-professional Third-class certificates are only valid for one year.

The examinations for teachers are conducted in the chief places throughout the Province on papers prepared by a central Board of Examiners, and the answers are returned to the same Board. The examinations extend over a space of one week, and the examiners are leading educationists of the Province.

The Normal School has been some two years in existence and is doing good work. The plan now pursued is to have it combined with the Winnipeg Public Schools. The Principal of the Normal School is the only teacher whose duties are confined to the Normal School, the upper grade teachers in Winnipeg receiving the Normal School students into the several classes taught by them. The Normal School has a winter session in Winnipeg of five months. The Principal of the Normal School holds Institutes, or Local Normal Schools, of one month each at leading educational centres throughout the country. Local educationists take part in these Institutes, and an impetus is given by them to education in the locality. The Institutes were held last year at Portage La Prairie, Brandon, Rapid City, and Birtle. They were conducted by the Normal School Principal and the Superintendent of Education. The time at these Institutes taken by teachers is counted at a certain value in the Normal School training required by them. The chief aim of the Normal School is to give training rather than instruction to the teachers. The students of the Normal School get no privileges so far as examinations are concerned, but they must pass at the annual Teachers' Examinations in August. It is but right to notice that Manitoba,

being largely settled by people from Ontario, has hitherto received a good supply of admirable teachers from the mother Province.

V. STATISTICS AND REVENUE.

The census having been taken in 1881, and an enormous flow of immigration having taken place to Manitoba since that time, it is only possible to give an estimate of the population. It is generally agreed that Manitoba has a population of from 150,000 to 200,000. There are at present 400 schools or districts belonging to the Protestant section, and fifty to Catholic. In the Protestant schools, in 1883, 123 males and 123 females were teaching. According to the returns for 1884, there were in attendance at the Protestant schools 10,831 pupils, and at the Catholic sections there were in attendance 1,941 in 1883. It will be noted that a considerable number of the organized districts have not their schools in operation. This arises from the very sparse population preventing their having schools carried on all the year round, as well as from the fact that, in the newer parts, except on a few main lines in winter, trails are not open in the more thinly populated localities. During 1884, the average number of days of attendance for pupils was 150 in cities and towns, and eighty in the country districts. The earliest school age allowed by the Act is five years; though so large a number of the schools belong to newly organized districts, that children of the age of eight, to ten years or more, enter school for the first time. About six years would probably represent the average in the older and better-organized schools. There is little difference between the male and female pupils in this respect. In a large number of our country schools, the farmers' children can attend school for but half the year; but up to the age of fifteen most of the children in the better school districts attend in the winter season. In the cities and towns, probably from twelve to thirteen years would represent the age of leaving school in the majority of cases, as work or situations can then be obtained. As stated already, the school course extends over ten years. In the early history of this Province, it is difficult to give statistics as to the number who leave school tolerably well acquainted with the three R's

of education; but the experience of the writer, who has been thirteen years in Manitoba, and has a good acquaintance with the Province, leads him to believe that, from the superior class of immigration, and the very general circulation of excellent newspapers from Winnipeg and elsewhere, the average attainment in this respect will compare with that of any Province of the Dominion.

As to Secondary Education, the collegiate departments have only been long enough in operation to send up one class of University students; this occurred for the first time, in May, 1884. On this occasion, twelve students from Winnipeg Collegiate department entered Manitoba University. To be added, however, to these, are the students coming to the University from the Preparatory Schools of the Colleges, each of the three Colleges having at present such departments. At the examination in May, 1884, there were twenty-one from these departments who entered the University. Thus, some thirty-five youths matriculated in Manitoba University, while a few others—probably not exceeding five or six—went to Universities in the eastern Provinces of the Dominion. The recent date of the educational institutions of the Province needs continually to be borne in mind in considering these statements. Some fifteen other students began the study of medicine in the Manitoba Medical College, in 1884, which in that year obtained its charter and is now affiliated to the Manitoba University.

The Provincial grant for the Protestant section for 1884 was \$33,159.98; but, as the schools become more numerous, there is an annual increase. The following is a list of the number of the schools for the different years given:—

Year.	Protestant.	Catholic.
1871	16	17
1874	22	21
1882	122	..
1883	380	45

The amount of money allowed annually by the Government is placed to the credit of the Board of Education. It is then divided

between the Protestant and Catholic sections, according to the relative proportion of Protestant and Catholic children of school age in the Province as obtained by the school census taken annually. From the proportion coming to the Protestant section, payment is first made to each school at the rate of \$50 for each half-year that it may be in operation,—each department in a city or town school counting as an individual school. Secondly, when the schools have received payment at the rate stated, the remainder of the grant set apart is divided among them according to average attendance.

The amount levied by the Trustees as local taxation for the Protestant schools for 1884 was \$178,140.05. The total amount expended in 1884 (including sums for school building) was \$363,775.85, and the cost of Governmental administration was \$6,627.56.

VI. TYPICAL SCHOOLS.

(1.) WINNIPEG CENTRAL SCHOOL.—The Central and Ward Schools of Winnipeg gave employment last year to fifty-four teachers. There are nine separate buildings in different parts of the city (one of them being a rented building) used as school houses. The site occupied by the Central School is almost in the centre of the triangle between the Red and Assiniboine Rivers. Facing the east is the Boys' Central School. This building also contains the office of the Inspector of City Schools. Facing the west, on the opposite side of the grounds, is the Girls' Central School. The area of the plot is divided into two equal parts, thus having one playground for boys and another for girls. The Boys' Central School contains 128,100 cubic feet. It has twelve rooms devoted to teaching. The rooms are nearly of the same size, each containing about 8,000 cubic feet, and being seated for forty pupils. There is no provision for artificial lighting, as the school buildings are kept for strictly public school purposes, and hence do not require to be lighted at night. As, however, Winnipeg is lighted both by gas and electricity, it would be easy to connect with either system if required. The building is heated by coal stoves, which burn the soft coal of the country from the Saskatchewan, or the anthracite from Pennsylvania. The provisions

for the ventilation of this school are good, there being cold-air and hot-air flues; the ventilation shaft is heated by the chimney, and thus retains heat enough to enable the vitiated air to be drawn into it and carried into the open air.

The Central School property is valued at \$50,000. The cost of the buildings erected upon it has been \$34,000. The furniture has cost \$9,000: there is no library: and the value of the apparatus is \$600. As to teachers' salaries, that of the first teacher of the Collegiate department is \$1,400; of the second, \$1,300; of the first master of Boys' School, \$1,250. The lowest salary of any Central School teacher—a lady teacher—is \$500. In this school there are eight male and four female teachers. No teacher is employed in the Winnipeg schools, who holds a certificate inferior to the Second class. Promotion from any grade to a higher is generally carried out in case of vacancies occurring; and such promotion is usually accompanied by an increase of salary. There is also a provision for a systematic increase of salary, taking into consideration length of service in our schools.

(2.) WINNIPEG WARD SCHOOLS.—Winnipeg being a city of from 20,000 to 25,000 inhabitants, and somewhat irregularly built, has a system of schools in the different city wards, in which pupils of the lower grades are taught. Of these there are seven. They contain from two to six rooms each, and are organized by having a male teacher as Principal in each, and subordinate female teachers. We may select the Carlton Street School in South Winnipeg. It is a neat brick building, two stories in height, and is situated in a plot of rather more than an acre in size. Its classrooms, six in number, are each about the size of one of the Central School rooms. The teachers of the Ward Schools are quite up to the standard of those of the Central School of the same grade, and the Ward Schools, so far as respectability is concerned, hold their own very well. Within the territory of Winnipeg it may be well to note that there are also two boys' schools and two girls' schools, under the control of the Catholic School Board. There are also throughout the city several girls' schools maintained as private enterprises, and there is St. John's Ladies School, chiefly under the influence and direction of the Church of England.

(3.) NORTH ST. ANDREWS COUNTRY SCHOOL.—This may be taken

as a type of the ordinary Country School. This school is situated twenty miles north of Winnipeg. It has a comfortable wooden building neatly finished, with a capacity of 15,000 cubic feet. The playground contains two acres. It is not subdivided into two parts. The grounds are supplied with necessary sanitary conveniences. The attendance of pupils is seventy, with an average of forty or fifty. The teacher has a Second-class certificate and is the sole teacher. It may be interesting to note that almost all the inhabitants of this district are natives, *i. e.*, of a mixture of White and Indian parentage. The trustees are also half-breeds, but they as well as the general average of the pupils are not behind those of other parts of the country in general intelligence. The teacher's salary is usually \$500.

VII. UNIVERSITY OF MANITOBA.

Any sketch of Education in Manitoba without mention of the University would be incomplete. The University is regarded with favour by all classes in the Province, inasmuch as it seems to have afforded a satisfactory solution of the difficulties in Higher Education arising from denominational and religious feeling. Manitoba University is the only source of degrees in Arts, Law, and Medicine in the Province. Its sole functions are to set a curriculum; to examine students and give them a standing; to confer degrees on the three Faculties named; to bestow scholarships and medals; and to administer its own funds. To the University the promise of 150,000 acres of land has been made by the Dominion Government. Recently, also, the University has received the sum of \$85,000,—a munificent bequest left by the late A. K. Isbister, Esq., a London barrister, who was born in Rupert's Land.

To the University there are affiliated the three Arts Colleges already mentioned, viz., St. Boniface (Roman Catholic), St. John's (Episcopal), and Manitoba (Presbyterian), as well as the lately organized Manitoba Medical College. These four Colleges have new buildings, which aggregate \$140,000 in value. The relation of the Colleges to the University may be called "federative." The Colleges are guaranteed absolute control of their own affairs, and choose representatives, who, with a few others appointed by cer-

tain other public bodies, make up the Council of the University. Provision is made by which the Governor-in-Council may affiliate other Colleges having suitable buildings and an adequate staff. Another power conferred upon the three Arts Colleges is that each may grant degrees in Theology. The University, however, examines the candidate for the Theological degree in classics and mathematics. When the College has conferred a degree in Theology, the graduate is reckoned a graduate of the University. Another most interesting feature of the University is that it gives the right to any student to take his examination in either English or French, the students of St. Boniface College being chiefly French-speaking.

The University has four annual examinations in Arts for the B. A. degree. They are named respectively: the Preliminary, Previous, Junior B. A., and Senior B. A. Examinations. The degree of M. D. is conferred upon examination. A course has also now been fixed for conferring the degree of LL.B. on the student passing certain examinations in Law. In 1885, the University of Manitoba has held its first examination other than for matriculation in Medicine; and in 1886 will be held its first examination in Law. The first examination in Arts was held by the University in 1878, and seven annual examinations have taken place since. For two years there could, of course, be no graduates. Since 1880, thirty-two candidates have received the degree of B. A. on examination. At the examinations of 1884, fifty-three candidates successfully passed in the several years. Upon the result of the examinations for 1885 the proceeds of the Isbister bequest will be for the first time bestowed as scholarships on deserving students. The annual amount for distribution from this source will be about \$4,000. The benefit arising from having only one source of degrees for the Province, secured by the University of Manitoba, has been generally felt. The University, though embracing elements so wide apart as Roman Catholics, Episcopalians, and Presbyterians, and though characterized by tongues so different as French and English, has been conducted since its beginning with the greatest harmony and satisfaction to all concerned.

VIII. GENERAL INTELLIGENCE.

We have now described the leading features of Education in Manitoba. Before stating the general condition of intelligence among the people, a word should be said about the Indian population. The whole number of Indians in the Northwest and British Columbia is 97,057. Of these, 34,520 are under treaty stipulations; and of these Treaty Indians there are 11,311 in the Manitoba agency. The Dominion Government is bound by treaty to maintain schools among the Indians. The treaties with the Manitoba Indians date from 1871 to 1875. There are forty-one school houses among these 11,000 Indians, and twenty-four schools are in operation. Hitherto the teachers have been of inferior qualifications, and have been wretchedly remunerated. It is hoped that there may be improvement in this respect.

In the general intelligence of its white population, Manitoba occupies a high place. The Dominion Post Office authorities state that the proportion of letters and newspapers passing through Winnipeg Post Office is very large compared with the numbers of the population; they state, moreover, that the standard of excellence in handwriting is above that of any other Post Office in Canada. It must be noticed, however, that the French native adult population can seldom write. A petition from a French parish with upwards of a hundred names, had all but six signed by a cross, along with "sa marque." The immigrating population of a higher class coming to Manitoba is great. Retired clergymen (five in one settlement), graduates of British and Canadian Universities, half-pay army officers, and the better class of British and Canadian farmers, all engaged in tilling the soil, are numerous. There are published in Winnipeg three daily newspapers, seven weeklies, and a number of monthlies. There are in Manitoba and the Northwest some forty newspapers published, printed in the leading places all the way from Lake of the Woods to the shadow of the Rocky Mountains.

One of the most powerful educative agencies in the Province, doing much by lectures and publications to keep alive a taste for literature and science, is the Historical and Scientific Society of Manitoba, which last year received and disbursed for its several purposes nearly \$4,000. Some account might also be given of

the number of Sunday Schools in Manitoba. At a late Convention of Sunday School teachers held at Portage La Prairie, 627 teachers and 6,415 pupils were reported. This, however, is but a portion. The church provision for the country is remarkably good. Judging by the last census the relative strength of the several churches in Manitoba may be represented by the following figures:—Episcopalians, 14; Presbyterians, 14; Roman Catholics, 13; Methodists, 9; Lutherans and Mennonites, 7; Baptists and Congregationalists, 2. The number of regularly ordained clergymen exercising their ministry in Manitoba in all the churches is probably about 160.

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XXVI.

EDUCATION IN ONTARIO.

ABBREVIATED FROM A REPORT PREPARED UNDER THE DIRECTION
OF THE PROVINCIAL MINISTER OF EDUCATION.

The educational progress of the Province of Ontario (formerly Upper Canada) was at first of very slow growth. Nearly eighty years ago an unsuccessful attempt was made to endow out of public lands a Grammar School in each of the four districts into which the Province was then divided, and a central University at York (now Toronto). But the sale of these lands was so slow, and the price per acre obtained for them was so small, that the revenue derived from this source barely defrayed the cost of management.

In 1807 the first legislative enactment was passed, establishing a Classical and Mathematical School in each of the eight districts into which Upper Canada was then divided. A grant out of the public revenue of £80 sterling (\$400) a year was made to each of these schools. That established at Cornwall (on the River St. Lawrence) under the mastership of the Rev. John Strachan—afterwards Archdeacon of York, and subsequently the first Bishop of Toronto—was the most efficient, and at it were educated most of the prominent men of after years.

In 1816, nine years after the establishment of the Grammar Schools, the Legislature of Upper Canada passed the first Common, or Elementary, School Law for that Province. It appropriated \$24,000 per annum for the support of the schools to be

established; and provided for the management of these schools by trustees elected by the inhabitants in the localities concerned. In 1820 a retrograde movement took place, and the annual grant was reduced to \$10,000.

In 1822, a Board of Education for Upper Canada was established under the presidency of Archdeacon Strachan, then residing in York (Toronto). It had under its supervision the district Grammar Schools, and had also the management of the University and Grammar School lands which had been granted for these purposes by George III in 1798. Some general regulations for the schools were adopted; and in 1824 a small grant was made to aid in the introduction of Common and Sunday-school libraries into the less sparsely settled portions of the country. Nevertheless the zeal of the public in behalf of education gradually languished; and it was not until 1835 that any systematic or vigorous effort was made by the public men of the time to revive it. In that year a bill to promote Public Elementary Education was introduced into the House of Assembly and passed, but it failed to pass the Legislative Assembly.

In order, therefore, to stimulate the public mind on the subject of education and to ensure the passage of a more comprehensive measure during the following session, a Commission was appointed to obtain evidence and draw up a report on the subject. In 1836, an elaborate report was prepared by Dr. Thomas Duncombe, M. P. P., Chairman of the Education Committee of the House of Assembly, on the state of education in the various parts of the United States of America which he visited. In the preparation of this report he was ably assisted by Dr. Thomas D. Morrison, M. P. P. (one of his colleagues). He also prepared a comprehensive draft of a bill which was printed with the report, but never passed. The political crisis which so quickly followed, and culminated in the outbreak of the Rebellion of 1837-8, overwhelmed in confusion all legislation, and prevented further attention being given to the subject for the time.

Nothing was done, therefore, with the view to promote education, until the union of the two Canadas in 1840. In 1841 a bill was introduced into the united Parliament and passed, establishing Common Schools in each of the two Provinces, and authorizing the establishment of "Roman Catholic Separate Schools" in

Upper Canada (in cases where the teacher of the Public School was a Protestant and *vice versa*). In 1842, it was considered desirable to supersede this Act by one more applicable to the circumstances and wants of each Province separately ; the "Separate" and "Dissentient" School provisions were however retained in each case.

In 1844, a further impetus was given to public education in Upper Canada by the appointment of the Rev. Dr. Ryerson, a distinguished native of the Province, to the office of Chief Superintendent of Education. This gentleman speedily set himself to reconstruct, upon a broader and more comprehensive basis, the entire system of Public Elementary Schools. As a preliminary step he devoted a year to the examination and comparison of the systems of education in Europe and America, and embodied the results in a "Report on a System of Public Elementary Instruction in Upper Canada." This valuable report sketches in an able manner the system of education which Dr. Ryerson subsequently so successfully established in the Province.

The chief outlines of that system are similar to those in other countries. Thus the Province is in a great degree indebted to New York for the machinery of our schools, to Massachusetts for the principle of local taxation upon which the schools are supported, to Ireland (originally) for the series of text-books, and to Germany for the system of Normal School training. All are, however, so modified and blended together to suit the wants and circumstances of the country, that they are no longer foreign, but are incorporated as part and parcel of our institutions.

The Educational System of Ontario will now be considered somewhat in detail. Education is one of the subjects within the exclusive jurisdiction of the Provinces which compose the Confederation of Canada.

The system in Ontario comprises the following :—

I.—The Public, Separate and High Schools, and Collegiate Institutes under the control of the Education Department.

II.—The Colleges and University provincially endowed, and subject to the control of the Provincial Government.

III.—Institutions for Special Classes, maintained and managed by the Provincial Government.

IV.—Institutions and Societies partly aided by Government, or under Government supervision.

V.—Schools, Colleges and Universities not under Provincial control.

VI.—Institutions partly Educational or Reformatory.

I. PUBLIC, SEPARATE, AND HIGH SCHOOLS, AND COLLEGIATE INSTITUTES.

The Education Department is entrusted with the control of the Public, Separate, and High Schools, and Collegiate Institutes of the Province. The Department, in the year 1876, by an Act of the Legislature of Ontario, underwent an important change in ceasing to be under the control of a Council of Public Instruction, with a Chief Superintendent, and is now composed of a Committee of the Executive Council of the Province, presided over by one of their number, as Minister of Education, and holding office with the other members of the Executive Council, subject to responsibility to the Legislative Assembly, according to the principles of the British Constitution. The Schools under the Administration of the Education Department comprise: (1) Public (or elementary) Schools; (2) Separate (or denominational) Schools; and (3) High (or secondary) Schools and Collegiate Institutes.

The Province of Ontario possesses a system of municipal or local self-government which is uniform throughout the Province, and, while symmetrical in its arrangement, is thoroughly practical and rests upon the free action of the ratepayers in each municipality. The organization comprises: (1) the minor municipal corporations, consisting of Townships, being rural districts of an area of eight or ten square miles, with a population of from three to six thousand; (2) Villages with a population of over seven hundred and fifty; and (3) Towns with a population of over two thousand. Such of these as are comprised within a larger district, termed a County, constitute (4) the County Municipality, which is under the government of a council composed of the heads of the different minor municipalities in such counties as have already been constituted in the Province. (5) Cities are established from the growth of towns when their population exceeds fifteen thousand, and their municipal jurisdiction is akin to that of counties and towns combined. The functions of each municipality are

commensurate with their respective localities. This municipal organization has been readily adapted to the requirements of a popular or national system of education.

In each minor municipality such as a township, local School Corporations for the township, or for a section thereof, at the option of the ratepayers, are established; and these are managed by trustees elected by the ratepayers, who are liable for the support of the Public Schools in their respective localities and are practically the owners of them. The trustees appoint the teachers who must possess the qualifications required by the Department. They arrange and pay the salary; purchase the school site (which may be acquired compulsorily); build the school house; and estimate (within certain restrictions) for collection by the Township Council of the rates for all funds which, in their judgment, are required for public school purposes. The trustees are under the obligation to provide adequate school accommodation, as defined by the regulations of the Education Department, for the attendance of all children of school age within the school division; to employ the required number of qualified teachers; to permit the children of all residents, between the ages of five and twenty-one, to attend school *free of further charge*. They are bound to keep the school open the whole year, except during vacations, and to send, to the Inspectors and the Department, the returns and reports required by the Law and Regulations; they must also take a census of the children between the ages of five and sixteen years inclusive, and especially, under the compulsory Act, those between seven and twelve years of age. In case any of the latter have not been under instruction for 100 days in the year at least, they must notify the parents, and can impose a rate of one dollar per month for each child in case the neglect continues, or may lay a complaint before a Justice of the Peace, who has power to fine, and in default imprison for the offence. Similar powers and obligations reside with the School Boards in cities, towns and villages. These boards can only raise the sums required for school purposes by requisition, according to their own estimate, upon the Council of the Municipality, which is bound (under certain conditions) to raise, by rate, the amount required by the trustees. The Council of the County municipality is entrusted with additional specific duties in respect of the town-

ships, towns and villages within the county, the most important being to levy by rate an amount equal to the Legislative grant for education, both amounts being solely devoted to the payment of teachers' salaries. The County Council also appoints Inspectors, possessing the qualifications required by the law and general regulations of the Department; pays one half of their salaries, the other half being paid out of Provincial funds; and appoints a County Board for the examination of Third-class (or lowest-grade) teachers. No teacher can be engaged by School Trustee Boards unless he holds a certificate acquired after examination, and upon compliance with the conditions of the general regulations of the Department.

The county, city and town councils, in appointing Inspectors, are limited to such teachers as possess certificates of eligibility, granted by the Department, and to two classes only, viz., (1) holders of First-class Provincial certificates, Grade A, and (2) graduates in Arts, with honours, of any of the Universities in the Province.

The Inspector's duties are to inspect every school at least twice in each year; to make the apportionment of the Legislative Grant and County equivalent to each school; to act as Chairman of the Examining Board of his district; to investigate, confirm, or set aside the rural school elections; to call meetings of rate-payers; to decide disputes; to suspend teachers' certificates, for cause; to give report on the state of the schools to the Department, and generally to see that the Law and Regulations are observed.

The Examiners appointed by the County Council must possess the qualifications prescribed by the regulations, and their functions are to examine candidates within their localities for Third-class Professional certificates, at the close of each session of the County Model or Training Schools.

The Central Committee of Examiners is appointed by the Department, and consists of High, Public, and Separate School Inspectors; and the present Professor of Moral Science in the Provincial University, who acts as chairman. Their chief functions are to prepare all the examination questions for each class of Public School Teachers' certificates, and to peruse and value the answers of candidates for First and Second-class certifi-

cates, and thus secure a uniform classification. This committee also prepares the questions for the Entrance and Intermediate examinations in the High Schools and Collegiate Institutes. Sub-examiners are appointed to aid in reading and reporting upon the answers for the Intermediate, Third and Second-class Non-professional examinations.

County Model Schools were established in each of the cities and large towns of Ontario, in August 1877, and have been highly successful. They are designed to afford facilities for the professional training of Elementary Third-class teachers. Each Head Master of these schools must hold a First-class Provincial certificate, and there must be three assistants at least, each holding a Provincial certificate. A practical and comprehensive syllabus of lectures for these schools was drawn up by the present Minister of Education, Hon. G. W. Ross, in 1878. It still forms the basis of the instruction given in these most useful and popular institutions. The County Model Schools are periodically inspected by the officer appointed for that purpose by the Education Department.

The receipts of moneys for Public School purposes, and the sources in the year 1883 were as follows:—

Legislative Grant.....	\$265,468
Municipal School Grants and Assessments.....	2,538,041
Local Educational Funds.....	767,222
Total.....	\$3,570,731

The expenditure and objects, were as follows:—

Teachers' Salaries.....	\$2,210,187
Maps, Prize and Library Books, etc.....	20,275
Repairs and Rent of School Houses, School Books, Stationery and Incidental Expenses.	565,626
School Sites and Buildings.....	312,342
Total.....	\$3,108,430

Separate Schools apply to Protestant and coloured persons as well, as to Roman Catholics; but this exception to the general Public School system is chiefly confined to Roman Catholics who desire to establish Separate Schools where their supporters are

sufficiently numerous to support one. The principle is, that any Roman Catholic ratepayer can elect to support a Separate School ; and, upon giving the prescribed notice, he is exempted from the Public School rates. They are governed by trustees elected by their supporters, and are a corporation with powers similar to that of other school trustees. Their teachers are required to possess proper certificates of qualification, and their schools share in the Legislative Grant in proportion to their attendance, and they are also subject to inspection by the Education Department. In case of any disagreement between the Separate and Public School corporations or municipal bodies, such dispute is subject to the arbitrament of the Minister of Education with the right of appeal to the Lieutenant-Governor in Council.

The following are the statistics of the Public Schools of Ontario for the year 1883 :—Number of Schools reported as kept open, 5,252. The number of Pupils attending the schools was 464,369, according to the ages following : Pupils under 5, 1,165 ; 5, to 16, 452,661 ; 17 to 21, 10,226 ; over 21, 317. The total school population, *i.e.*, between the ages of 5 and 16, was 478,791. The number reported as not attending any school is 7,266. The average attendance, namely, the average daily attendance, divided by the legal teaching days of the year, was 215,561, or 46 per cent. The number in the different classes is as follows :—

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.
164,035	106,482	113,980	70,104	8,919	849

The circumstances of Public Schools situated in the cities and towns, and those in rural districts differ in this, that in the latter there are two classes of pupils, the elder, who chiefly attend during the winter months, and the younger in the warmer seasons. The average attendance accordingly shows this contrast :—

Attendance in Cities.....	59 per cent.
“ “ Towns.....	55 “
“ “ Rural Districts.....	43 “

The number of teachers is 6,911,—2,829 being males, and 4,082 females.

The following were the qualifications of the different teachers in the year 1883 :—

Provincial First-class.....	211
" Second-class.....	2,167
Old County Board First-class Certificates.....	183
" " Second-class " 	71
New County Board Third-class Certificates.....	3,426
Interim Certificates.....	603
Other " 	250

The average salary of male teachers in Counties, was \$394; of female teachers, \$252. In Cities, of male teachers, \$764; of female teachers, \$362. In Towns, of male teachers, \$605; and of female teachers, \$277. The Separate School teachers (excluding teachers who are members of religious orders) are included in the above statement. The number of Roman Catholic Separate Schools is 194, and of pupils, 26,177.

The High Schools, like the Public Schools, are open to pupils of both sexes who can pass an entrance examination chiefly in the fourth-class work of the Public Schools. The High Schools are intended to furnish a higher English, or a classical, course with modern languages, so that the pupils may be fitted to pass the matriculation examination in the University, or to enter business. High Schools which have four masters at least, and have attained a certain standing as to accommodation, equipment, and general efficiency, are called Collegiate Institutes. There is a Legislative Grant in aid of these schools, which, supplemented by the County Grant, now made equal by the Act of 1877 to the amount of the Legislative aid, is based on the amount of teachers' salaries, and to some extent on attendance. There is to be a further allowance out of Provincial funds, based on the general efficiency of the schools, especially in point of equipment. Any County Council can establish High Schools with the consent of the Provincial Government, and they are subject to the supervision of the Education Department by Inspectors of its own appointment. The Head Masters are required to be graduates in arts of British or Colonial Universities, of proved efficiency as teachers, and to possess a certificate to that effect from the Department.

In the year 1883, the following was the condition of the High Schools:—The number of Schools, 104; number of Pupils, 11,843. The total expenditure in 1883, was 348,946. The total receipts amounted to \$378,889, derived from the following sources:

Legislative Grant, \$84,990; Municipal Grant, \$208,161; Pupils' fees, \$30,067; and other sources, \$55,672. Out of the receipts, the amount paid for salaries of masters was \$266,317; for building, rents and repairs, \$20,012; maps, libraries, prize books, and other expenses, \$62,617.

II. SCHOOLS, COLLEGES AND UNIVERSITY, PROvincially ENDOWED AND SUBJECT TO THE CONTROL OF THE PROVINCIAL GOVERNMENT.

These institutions come next in order. They are exclusively Provincial, being supported by Provincial funds and subject to the general control of the Government, but they possess their own Councils or governing bodies, and are not within the jurisdiction of the Education Department as such.

Upper Canada College was founded in 1828, upon the model of the great Public Schools of England, and was endowed with a large grant of public lands, from which it now derives an annual income of \$15,000, in addition to its building and grounds in the City of Toronto. Its pupils number about 300, and it aims at preparing them for matriculation in the Provincial University, and for different professions and pursuits.

The corporate designation of the University is that of the *University of Toronto*. It was originally established by Royal Charter, and endowed with a grant of public lands in 1828. The annual income from this endowment now exceeds \$55,000. The institution was inaugurated and opened for students in 1827. The governing body consists of the Senate. The Convocation, composed of all the graduates, elects the Chancellor and fifteen members of the Senate, the Provincial Government nominating nine. The Senate has power to confer degrees (but not honorary degrees) in the several faculties of Arts, Law and Medicine, and certificates in Engineering and Agriculture, after the different examinations prescribed in the curriculum, and subject to its provisions for attendance upon lectures in University College, or other affiliated schools or colleges. The Senate can also provide for local examinations, and may recommend to the Lieutenant-Governor-in-Council the establishment of professorships in any department of knowledge, science, or art in University College.

The question co-education has of lately occupied a good deal of public attention in Ontario. It was, so far as it related to University education, discussed at some length in the Legislature of the Province in 1884, and the following Resolution on the subject was passed: "That, inasmuch as the Senate of the Provincial University has for several years admitted women to the University examinations and class lists, and inasmuch as a considerable number of women have availed themselves of the privilege, but labour under the disadvantage of not having access to any institution which affords the tuition necessary in the higher years of the course,—in the opinion of this House provision should be made for that purpose as early as practicable in connection with University College."

Besides University College, which forms part of the Provincial University system, supported by the Provincial endowment, there are several institutions which, maintained from private sources, are affiliated to the University, and are entitled to send up to its examinations students who have conformed to the prescribed curriculum. Amongst such may be mentioned the Woodstock College, the Toronto School of Medicine and the Trinity Medical School, but these properly belong to another class, and need not be further considered here.

Since the opening of the University in the year 1843, the number of students who matriculated up to the end of the year, 1883, is as follows:—In Law, 187; in Medicine, 624; in Arts, 1,907; in Civil Engineering, 43; and in Agriculture, 20; or the total number of 2,781.

The number of degrees conferred in the several faculties is also as follows:—In Law, 155 (LL.B.); in Medicine, 575 (M.B.); in Arts, 1,108 (B.A.); or the total number of 1,838.

Scholarships in the different faculties are annually awarded upon the result of the examinations in the University. There are thirty-nine in the Faculty of Arts alone, in sums of \$120 and \$80 respectively.

III. PROVINCIAL INSTITUTIONS FOR SPECIAL CLASSES, MAINTAINED AND MANAGED BY THE PROVINCIAL GOVERNMENT.

The Legislature of the Province has established several insti-

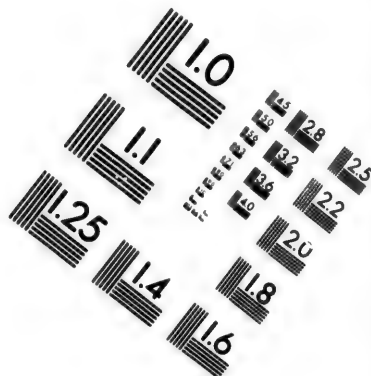
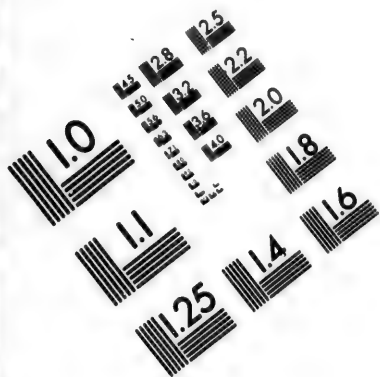
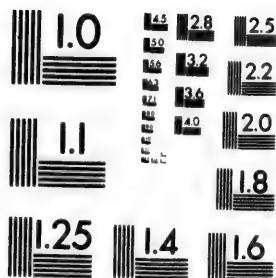


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tutions of a specific character, and maintains them by annual grants out of the Provincial revenue.

In 1870, the *Institution for the Education of the Deaf and Dumb* was established in the city of Belleville. Such pupils as are unable to be maintained by their parents or guardians, are clothed, boarded, and educated free of charge.

In 1871, the *Institution for the Blind* was established in the city of Brantford. Admission is refused to the aged, infirm, or to imbeciles. Pupils unable to pay are boarded and taught gratuitously.

The *School of Practical Science* was opened in September, 1878, in a building, and with appliances specially adapted to lectures of a practical character in the subjects of Natural and Physical Science, and of Engineering.

In 1874, the *School of Agriculture* at Guelph was opened. Its objects are to teach the practice and theory of Husbandry to young men engaged, or intending to engage, in Agriculture; and to conduct experiments of general interest to Agriculture.

IV. INSTITUTIONS AND SOCIETIES PARTLY AIDED BY GOVERNMENT OR UNDER GOVERNMENT SUPERVISION.

(1.) *Mechanics' Institutes* may be established as corporations under a general Act, for providing a library and evening classes. Each is entitled to receive from the Legislature an annual grant of \$400, conditional upon the local contribution being at least \$200, and upon being subjected to Government inspection. At the present time there are over one hundred Mechanics' Institutes in Ontario; the annual vote for their support is \$25,000.

The following abstracts are taken from the Annual Reports of Mechanics' Institutes for last year:—

CLASSIFICATION OF INSTITUTES REPORTING.

Number of Institutes with Library, Reading Room and Evening Classes	25
Number of Institutes with Library and Reading Room.	34
“ “ with Library and Evening Classes	4
“ “ with Library only	30
Total	93

The present Minister of Education (Hon. G. W. Ross) is determined to make the institutes of more practical value to mechanics and artisans, and in order to prevent such large amounts being expended for fiction, and to induce the establishment of evening classes, has issued instructions that in future the grant shall be divided as follows :—

	GOVERNMENT GRANT.	LOCAL APPROPRIATION.
Library.....	\$200.....	\$100.....
Reading Room.....	100.....	50.....
Evening Classes....	100.....	50.....
	\$400	\$200

It is proposed to establish evening classes for industrial drawing in these institutes, so that they will really be branch Art Schools subject to the rules of the Education Department. A programme of studies will be sent to each institute, and examinations for certificates will be held at the close of each session. In order to encourage these classes, additional sums will be paid of \$1 for every student who receives a certificate for one subject ; of \$2, for two subjects ; and of \$4, for students who obtain certificates in all the elementary subjects.

(2.) *The Educational Museum.*—In 1849 an Act was assented to, granting five hundred pounds per annum for the establishment and support of a School of Art and Design for Upper Canada, to be in connection with the Normal School; this fund was allowed to accumulate for several years, and together with special grants was expended in the purchase of a collection of objects of Art, which gradually increased so much in size that it became necessary to erect new school buildings and devote all the lecture rooms, etc., to the purposes of the museum. Although the original plan of having a School of Art and Design was not carried out, the museum was thrown open free to the public every day except Sunday, and students had the privilege of copying from the paintings, statuary, etc. As an indirect aid to art the museum has been very valuable ; it is now, however, being made of more practical benefit. The Ontario School of Art is now conducted in adjoining apartments, so that students may have access to the examples of study.

(3.) *The Ontario School of Art* was established by the Ontario Society of Artists in 1876, and other Art Schools in the Province are now being associated with this school for examination purposes. At the last examination several certificates were granted to the pupils of Alma College, St. Thomas, and Wykeham Hall, Toronto ; other institutes will be associated next term.

The Hon. the Minister of Education, having taken into consideration the importance of making industrial drawing a part of our educational system, has given directions that Free Industrial Drawing Classes be established for the benefit of High and Public School teachers, during the ensuing summer vacation, the course to consist of twelve lessons on each of the following subjects :—

Freehand Drawing, from flat examples.
Practical Geometry.
Linear Prospective.
Model Drawing.
Blackboard Drawing from memory.

Over 150 teachers have already enrolled their names.

As it is proposed to establish drawing classes in connection with the Mechanics' Institutes throughout Ontario, teachers who hold these certificates will have an opportunity of augmenting their salaries, and at the same time imparting technical instruction which will aid in developing the manufacturing industries and wealth of our Province. Increased accommodation is now being provided at the Education Department, and the school will in future be under the control of the Minister of Education.

Several societies, partly educational, are also annually aided out of the Provincial Treasury, such as the Agricultural and Arts Association, the Ontario Society of Artists, the Canadian Institute, and the Entomological Society.

V. SCHOOLS, COLLEGES AND UNIVERSITIES, NOT OF A PROVINCIAL CHARACTER.

Causes of a social and denominational character have given origin to several Schools, Colleges and Universities which, maintained by their special supporters, are taking part in the work of education in the Province. Of these, few are to be found in

the rural districts, and the number in all does not much exceed 200. But schools of a private nature, and some of a superior order, are to be found in the cities and larger towns. These together number 297, with some 8,000 pupils, and 569 teachers.

Under denominational control, the following Colleges and Universities are to be noticed :—

(1.) *The University of Victoria College*, Cobourg, which obtained University powers, in 1841, to confer degrees in the several faculties which comprise arts and science, theology, law and medicine. It belongs to the Wesleyan Methodists.

(2.) *University of Queen's College*, at Kingston, under the control of the Presbyterian Church of Canada (formerly in connection with the Church of Scotland). This College was incorporated by Royal Letters Patent in 1841, and endowed with University powers.

(3.) *University of Trinity College* was established for the instruction of members of the Church of England, and obtained a Royal Charter in 1852, which empowered it to confer degrees in divinity, law, arts and medicine.

(4.) *The Western University* of London, Ontario, was incorporated by Act of the Legislature of Ontario, in March, 1878, in connection with the Church of England in Canada, with power to affiliate with Huron College, a similar Church of England Institution, and to confer degrees in arts, divinity, medicine and law. Huron College, on June 24th, 1881, became affiliated with the Western University, and constituted its Faculty of Divinity.

(5.) *Albert University* was established at Belleville by the Methodist Episcopal Church in 1857, and obtained University powers in 1871.

(6.) *The Ottawa College* is under the direction of the Roman Catholic Church, and obtained University powers in 1866.

Denominational Institutions of the like character to the preceding have been established by other religious bodies, but without acquiring University powers, their main object being the education of youths for the ministry in their respective churches.

The Presbyterian Church in Canada established *Knox College*, 1844. The course is theological, and the college now owns and occupies a commodious edifice in Toronto.

Huron College, situated at London, is of like character in con-

nection with the Church of England ; it was founded in the year 1863. It is a purely theological college, and pledged to the maintenance of the principles of the Church of England known as Evangelical. The Association of the Alumni of this college, obtained from the Provincial Legislature, during the session of 1878, power to establish a University under the name of "The Western University of London, (Ontario)."

Woodstock College, while affiliated with the University of Toronto, is designed to afford a course of instruction in arts and science. The theological department, for the training of ministers in connection with the Baptist Church, is in McMaster Hall, Queen's Park, Toronto.

McMaster Hall was established chiefly through the liberality of the Hon. Senator McMaster, for the theological training of candidates for ministry in the Baptist Church.

Wycliffe College was established through the active exertions of the evangelical section of the Church of England for the training of candidates for Holy Orders.

Schools and Colleges for the higher education of women comprise:—

1. *The Wesleyan Female College* is incorporated by Act of the Provincial Legislature, and was opened in 1861. Although in connection with the Methodist body, its President and members of the Board may belong to other Protestant denominations, from whom pupils come, and they are at full liberty to attend their own churches.

2. *The Bishop Strachan School*.—This school founded by the late Bishop Strachan, of Toronto, is in connection with the Church of England, and affiliated with the University of Trinity College. It is open to all pupils who may conform to its regulations. It was incorporated by Act of the Provincial Legislature in 1868, but began work on September 12th, 1867. It removed in 1870 to its present building, Wykeham Hall, Toronto.

3. *The Hellmuth Ladies' College* is situate near the city of London (Ontario), and was founded by the Right Rev. I. Hellmuth, D. D., the Anglican bishop of the diocese of Huron. It was inaugurated in 1869 by Prince Arthur. It is now affiliated with the Western University.

4. *The Ontario Ladies' College*, at Whitby, was incorporated by

Act of the Legislature in 1884, and inaugurated by Lord Dufferin. It is in connection with the Methodist Church.

5. *The Brantford Young Ladies' College* was established in 1874, and is in connection with the Presbyterian Church in Canada.

6. *The Ottawa Ladies' College and Conservatory of Music* was incorporated by Act of the Legislature in 1869, and is in connection with the Presbyterian Church. The majority of the board of management is required to be Presbyterians.

7. *Alma College* was established at St. Thomas, in connection with the Methodist Church, in place of "Alexandra College,"—the ladies' branch of Albert College at Belleville.

Besides the ladies' schools mentioned, there are convents in each of the Roman Catholic dioceses of the Province, in which much attention is paid to the higher subjects of education for ladies. They are respectively situated at Toronto, Ottawa, Kingston, Hamilton and London. Superior private schools, for the education of young ladies, exist in Toronto and other places in Ontario.

In connection with professional pursuits, the Law Society of Ontario is authorized to admit students to practise the profession, and also to call to the degree of barrister-at-law.

For instruction in medicine, the following schools exist:—The Toronto School of Medicine, affiliated to the University of Toronto; the Toronto Medical School, affiliated to the University of Toronto, and also to that of Trinity College; the Royal College of Physicians and Surgeons at Kingston; there is besides a Veterinary College in Toronto.

VI. INSTITUTIONS PARTLY EDUCATIONAL OR REFORMATORY.

In addition to the institutions properly educational, there are others whose objects are of some such character, and which are striving for the amelioration and reformation of those classes which come within the scope of their operation. Of these may be noticed those directly maintained out of Provincial funds, and controlled by a department of the Government. In the *Provincial Reformatory*, Penetanguishene, there are 263 boys, who have been committed to it on being tried for criminal offences. Part of their time is given to instruction, and part to training in vari-

ous industries, and the general results of the treatment have proved favourable.

The Central Prison was established by the Province in 1873 for the purpose of reforming ordinary offenders whose sentences were of limited duration. The short experience of its effects shows that the influences are of a beneficial and reforming character. Offenders consigned to it are free from the contaminating associations to be found in the ordinary gaols of the Province; and, being instructed in various trades, leave the prison better fitted for earning an honest living in the future.

The Public Schools are unable to reach the class of neglected children which are to be found in cities and the larger towns, and *Boys' and Girls' Homes* have been established by individuals and societies to meet this want. They care for, educate, and train a large number of such children, and their efforts are aided out of the Provincial Treasury according to the number who are cared for in each institution.

Finally, the *Sunday Schools* existing in the Province are estimated at 3,600, with 200,000 scholars, and 23,000 teachers.

Relying upon these popular and national agencies, and those which special considerations have developed, the Province of Ontario is steadily pursuing a career of progress, material, moral and intellectual. The interest in education is wide-spread throughout the whole Province, and its people understand ' much their further progress, welfare, and happiness depend upon the continued efficiency and improvement of their educational agencies, for which the fullest opportunities are afforded by their system of local self-government, and free political institutions.

NOTE.

In the Province of Ontario, the following provisions have been made for the Education of Women in Universities :

1. The University of Toronto has since 1877 admitted women to some of the University examinations, and during the present year (1884-85) they have been placed on the same footing as men with full permission to proceed to a degree in the Faculty of Arts.

2. By a resolution of the Provincial Legislature, quoted page 323, women have been admitted to the classes in University College, Toronto, which is the Provincial College of Ontario.

3. Trinity College, Toronto, admits women to degrees in medicine only, undergraduates being prepared at the Women's Medical College, Toronto. In arts and music, women are admitted to University examinations for which certificates are given. For the arts examination they are prepared by the Bishop Strachan School (see page 328); for music there is no provision. The course of study for women in arts is equivalent in extent to the ordinary curriculum with some changes: Greek is not compulsory, and Italian is optional; mathematics and the theory of music are alternative courses.

4. Queen's University, Kingston, admits women without reservation to all University privileges accorded to men. There is a Women's Medical College in Kingston, the students of which attend certain classes, as Botany, Chemistry, etc., in the arts department of the University.

5. In Victoria University, Cobourg, women have for ten years been admitted to all the privileges of the University, upon entire equality with men.

—Ed. *Can. Econ.*

XXVII.

L'INSTRUCTION PUBLIQUE DANS LA PROVINCE DE QUÉBEC.

PAR PAUL DE CAZES.

I. PRÉCIS HISTORIQUE.

Dans un excellent ouvrage que l'honorable M. Chauveau, qui a été pendant dix-huit ans à la tête du département de l'Instruction publique du Canada et de la province de Québec, publiait, il y a quelques années, sous le titre de *Précis historique et statistique sur l'Instruction publique au Canada*, on trouve de précieux renseignements sur les développements de l'éducation dans toutes les provinces de la Confédération, en général, et dans la province de Québec, en particulier.

M. Chauveau fait remonter à l'année 1616 les premiers essais d'instruction tentés dans la Nouvelle-France. Les premiers, les Récollets essayèrent d'inculquer les éléments de l'instruction aux populations indigènes. A cette époque, le frère Pacifique Duplessis faisait l'école aux enfants sauvages des Trois Rivières, leur enseignant la lecture et l'écriture, en même temps que le catéchisme. Les relations du temps mentionnent aussi que vers 1632 les pères jésuites Lejeune et Lallemant faisaient l'école : le premier aux sauvages, et le second aux enfants des premiers colons français qui fondèrent la colonie.

Dès 1637, un collège se construisait à Québec. Deux ans après, Mme de la Peltrie et la Mère de l'Incarnation fondaient dans la

même ville le monastère des Ursulines, qui ouvrit la première école de filles dans la Nouvelle-France. D'un autre côté, M. de Maisonneuve, gouverneur de Montréal, faisait venir, en 1653, la sœur Marguerite Bourgeois, fondatrice, dans le Nouveau-Monde, de la Congrégation de Notre-Dame. Les religieuses de cet ordre, qui firent pour la première fois l'école dans un hangar en 1657, comptaient déjà, en 1747, douze maisons d'éducation de plus ou moins d'importance, établies dans les principales paroisses de la colonie. Puis, en 1663, Mgr de Laval, évêque de Québec, établissait, dans sa ville métropolitaine, un grand séminaire auquel il adjoignait cinq ans plus tard le petit séminaire qui existe encore aujourd'hui. Dès avant 1740, les prêtres de St. Sulpice, établis depuis près d'un siècle (1647) à Montréal, y entretenaient des écoles de garçons; plus tard, en 1773, ils fondaient leur collège.

Pendant assez longtemps, les progrès de l'instruction, ceux de l'instruction élémentaire surtout, furent lents dans le Bas Canada. En raison des difficultés qu'éprouvaient les promoteurs de l'œuvre à obtenir les subsides suffisants pour la soutenir, à cause surtout de la mauvaise organisation du système lui-même, le clergé catholique avait dû s'emparer de l'initiative et marchait, la plupart du temps, avec ses propres ressources.

Cependant, lorsqu'en 1787 lord Dorchester chargea un comité du conseil exécutif de faire une enquête dans le but de porter remède à l'insuffisance de l'instruction publique dans le pays, il y avait déjà de 24 à 30 personnes par paroisse qui savaient lire et écrire, et la plupart des villages quelque peu peuplés, entre autres ceux de l'Assomption, Boucherville, Laprairie et Terrebonne, avaient des instituteurs.

En 1801 le Parlement votait une loi intitulée "Acte pour établir les écoles gratuites et pour le progrès de l'Instruction," autorisant le gouvernement à établir une corporation sous le nom d' "Institution Royale."

L'Institution Royale fit faire peu de progrès à l'instruction publique tant qu'elle en eut le contrôle, c'est-à-dire jusqu'à ce qu'elle fût dissoute par l'Acte d'Éducation de 1841.

Comme les parents catholiques étaient généralement peu disposés à envoyer leurs enfants à des écoles sous le contrôle d'une institution dont l'évêque anglican était le président, et à laquelle l'évêque et le clergé catholiques n'avaient jamais voulu donner

leur concours, le parlement vota la loi dite "des écoles de Fabrique" qui autorisait le curé et les marguilliers à affecter un quart des revenus de leur corporation paroissiale au soutien d'écoles placées sous leur direction exclusive.

Une loi intitulée "Acte pour l'encouragement de l'éducation élémentaire," voté par la Législature en 1829, établissait, entre autres choses, les syndicats scolaires et créait un fonds pour la construction des écoles. Quoique très incomplète encore, cette loi paraît avoir été le premier essai sérieux de législation fait pour l'organisation d'un système scolaire régulier.

Cependant, en 1836, le nombre des écoles primaires en activité n'était encore que de 1,321, et celui des élèves des deux sexes qui les fréquentaient de 30 000 environ. Néanmoins, M. Garneau, dans son histoire du Canada, porte à 57,000 le nombre total des élèves des maisons d'éducation de tout genre, à cette époque, ajoutant aux élèves des écoles primaires ceux des écoles indépendantes, des collèges et des couvents.

Dans cet entre-temps, plusieurs collèges, devenus depuis de grandes maisons d'éducation supérieure, furent érigés grâce aux efforts et au zèle des membres du clergé et d'un certain nombre de laïques qui s'étaient dévoués au succès de cette noble cause. Parmi ceux-ci, et en première ligne, se trouvait M. Joseph F. Perrault,* protonotaire de Québec, ancien député à l'Assemblée Législative, qui consacra ses loisirs et une partie de sa fortune à cette œuvre éminemment patriotique. Ce philanthrope, qui mourut en 1844, à l'âge de quatre-vingt-onze ans, est l'auteur d'un grand nombre d'ouvrages sur l'histoire du Canada, l'éducation et l'agriculture.

Pendant la session de 1835-36, on s'occupa quelque peu de régulariser le système d'éducation très défectueux qui existait alors. Le Parlement vota même, pour être appliquée à ces fins, une allocation de sept mille six cent vingt livres sterling. Il décréta aussi l'établissement d'écoles normales à Montréal et à Québec; mais cette dernière loi n'eut pas d'effets immédiats.

Après l'union du Haut et du Bas-Canada, quelques réformes faites dans l'administration de l'instruction publique eurent l'effet

* La vie de M. J. F. Perrault a été publiée dernièrement par son petit-fils, M. le Dr P. Bender.

de donner un nouvel essor à l'éducation dans la province française ; ainsi, tandis que le nombre des écoles primaires était, en 1847, de 1,613, ayant 63,281 élèves, un rapport fixe à 1,817 le nombre des écoles, et à 68,994 celui des élèves, en 1849. Les années suivantes, grâce aux lois que firent passer les gouvernements Lafontaine-Baldwin, en 1850, et Hincks-Morin, en 1852, l'augmentation qui se manifestait devint encore plus sensible, car en 1854, le nombre des institutions scolaires était déjà de 2,795, et celui des élèves de 119,737.

M. le docteur Meilleur, nommé en 1842 surintendant de l'Instruction publique, doit être considéré comme le créateur du système d'éducation actuel. Dans l'accomplissement de sa tâche, il eut longtemps à combattre le mauvais vouloir de la majorité de la population d'alors dont son énergique persévérance finit par triompher.

L'honorable M. Chauveau, qui lui succéda, et fut de 1855 à 1873 à la tête du département de l'Instruction publique, travailla ardemment à parachever l'œuvre de son prédécesseur.

C'est sous son administration qu'en 1857 trois écoles normales furent créées : deux catholiques et une protestante ; qu'un journal de l'Instruction publique, publié dans les langues française et anglaise fut fondé et qu'une bibliothèque qui contient quinze à seize mille volumes, avant qu'une grande partie fut transférée au Parlement, fut installée dans les bureaux du ministère de l'Instruction publique.

De son côté, l'honorable M. Ouimet, tant comme ministre de l'Instruction publique que comme surintendant, charge qu'il occupa depuis février 1876, a su, par une administration intelligente et vigoureuse affermir notre système scolaire auquel il a fait subir plusieurs réformes utiles.

II. SYSTÈME D'ENSEIGNEMENT.

Dans un discours qu'il prononçait le 25 juin 1880, devant le Congrès catholique réuni à l'occasion de la fête nationale des canadiens français, l'honorable M. Ouimet traçait à grands traits les lignes principales du système d'instruction publique en opération dans la province de Québec.

“ Notre enseignement se divise en trois classes : disait-il :

1° L'enseignement supérieur.

2° L'enseignement secondaire.

3° L'enseignement élémentaire.

" Nous possédons trois universités qui ont le pouvoir, par des chartres royales, de conférer des degrés pour les Sciences et les Lettres.

" Viennent ensuite un assez grand nombre de collèges dont les cours classiques sont aussi complets qu'en aucun pays du monde.

" Toutes ces institutions, à l'exception de l'Université Laval et des séminaires de Québec et de Montréal, reçoivent une subvention de l'État, sur les sommes accordées comme aide à l'instruction publique.

" Ce qui doit présenter le plus d'intérêt, c'est le développement de notre instruction élémentaire, c'est-à-dire, la seule, le plus souvent, à la portée des classes peu aisées de nos campagnes, qui, dans tous les rangs de la société, sert de base à une instruction plus complète et dont dépend souvent l'avenir des enfants qui la reçoivent.

" Je dirai en peu de mots sur quoi repose notre système scolaire primaire, qui a été considéré comme un des plus parfaits qui existent, par les hommes spéciaux chargés, pendant la dernière grande exposition de Paris, d'examiner les résultats obtenus par les systèmes d'éducation en vigueur chez les différents peuples, et qui a valu à la province de Québec quatre diplômes, quatre médailles de bronze et quatre distinctions honorifiques de premier ordre.

" Pour l'application de ce système d'éducation, la province est divisée en municipalités scolaires régies par cinq commissaires d'écoles. Mais, quand dans une localité il existe un certain nombre de familles qui ne partagent pas les croyances religieuses de la majorité des habitants, celles-ci ont le droit d'avoir pour leurs enfants des écoles séparées qui sont contrôlées par trois syndics. Chacune de ces écoles reçoit alors du gouvernement une subvention proportionnée au nombre d'enfants d'âge à y assister. Le montant que le gouvernement débourse ainsi chaque année, s'élève au chiffre assez rond de \$165,000.

" Commissaires et syndics d'écoles.

" Ce dualisme est le corollaire du dualisme des religions et des nationalités qui se partagent le pays. L'État protège également

le Français et l'Anglais, et partant, les deux croyances religieuses. De fait, l'État s'unit aux deux cultes, et, en matière d'éducation, il n'autorise pas une école à être athée; mais, s'il lui demande d'être chrétienne pour lui accorder ses secours, il n'exige pas qu'elle appartienne à une église plutôt qu'à une autre. Liberté pleine et entière sous ce rapport; et de là harmonie parfaite dans la population.

"Ces deux corps de commissaires et de syndics représentent le peuple. Ils administrent suivant la loi, chacun pour ceux dont ils sont les mandataires; donc, pas de conflit de religion, ni de nationalité.

"Nous n'avons pas de conseils, encore moins de leçons à donner à l'étranger; mais il nous est permis de nous féliciter d'avoir su appliquer si avantageusement pour nous le grand principe de la liberté de l'enseignement.

"Des inspecteurs d'écoles, au nombre de trente-six, sont tenus de faire, deux fois par année, la visite de chaque école et de fournir au département de l'Instruction publique un état détaillé de leurs opérations.

"Enfin, pour aider le Surintendant dans ses travaux d'administration, on lui donne un conseil composé d'hommes hautement recommandables et offrant par leur honorabilité et leurs capacités reconnues toutes les garanties désirables, qui sont nommés par le gouvernement et choisis dans les différentes parties de la province. Qu'il me suffise de dire que dans ce conseil formé de dix-sept catholiques et de huit protestants,* entrent, de droit, les huit évêques de la province, chacun d'eux représentant son diocèse, qui se trouve être pour lui une division scolaire, dont il surveille la direction morale et intellectuelle. Le conseil général se divise en comités catholique et protestant: le premier composé de dix-sept membres,* et le second de huit, ces derniers étant autorisés par la loi à s'adjoindre cinq membres supplémentaires.

"Le conseil général de l'Instruction publique est présidé par le Surintendant dont la mission est de faire fonctionner tous les rouages de notre système scolaire."

* Depuis, trois nouveaux membres ont été ajoutés: deux au comité catholique et un au comité protestant.

III. DIVISION DE L'ENSEIGNEMENT.

L'Instruction publique comprend cinq grandes divisions dont quelques-unes se subdivisent en plusieurs sections, savoir :

1. Les écoles supérieures ou universités.
2. Les écoles secondaires.
3. Les écoles primaires.
4. Les écoles spéciales.
5. Les écoles normales.

1. UNIVERSITÉS.—La province de Québec possède quatre maisons d'éducation supérieure, deux françaises et catholiques : les universités "Laval," à Québec et "Victoria," à Montréal, et deux anglaises et protestantes : l'université "McGill," à Montréal et le "Bishops College," à Lennoxville.

L'université *Laval* qui est sans contredit une des maisons d'éducation supérieures les plus importantes de l'Amérique, a reçu sa charte impériale en 1852.

Cette institution est attachée au Séminaire de Québec, et comme cette maison, complètement indépendante du gouvernement, de qui elle ne reçoit aucune subvention. Elle est administrée : par un visiteur qui, en vertu de sa charte, doit toujours être l'Archevêque de Québec, un recteur qui ne peut être que le Supérieur du Séminaire et un conseil composé de douze membres choisis parmi les professeurs de l'établissement dont six sont ecclésiastiques et six laïques.

L'université comprend les facultés de théologie, de droit, de médecine et des arts ; cette dernière se subdivisant en deux sections : les sciences et les lettres. Les cours sont de quatre ans pour la théologie et la médecine, et de trois ans pour le droit ; il n'y a pas de cours réguliers pour la faculté des arts. Elle délivre pour chacune de ces facultés des degrés de bachelier, de licencié ou maître et de docteur.

En 1876, l'Université Laval a établi une succursale à Montréal soumise aux mêmes règlements et jouissant de tous les privilèges de la maison-mère. Elle compte 78 professeurs : 42 à Québec et 36 à Montréal.

Le tableau suivant donne le nombre des étudiants qui ont suivis les cours de cette institution, ainsi que la quantité et le rang des diplômes qu'elle a délivrés en 1882-83.

	ÉTUDIANTS			DIPLOMÉS*		
	Québec	Montréal	Total	Bacheliers	Licenciés	Docteurs
Théologie.....	84	183	267	1	2	3
Droit.....	70	74	144	26	7	1
Médecine.....	59	45	104	7	8	17
Arts.....	83	.....	83	17	3	.....
Total.....	296	302	598	51	20	21

Les musées d'anatomie et d'ethnologie et les collections géologiques, minéralogiques et botaniques de l'Université Laval sont fort remarquables.

La bibliothèque, qui possède probablement la collection la plus complète qui existe des ouvrages publiés sur le Canada et toute l'Amérique, contient près de 70,000 volumes collectionnés avec soin et intelligence.

L'université McGill, ainsi appelée du nom de son fondateur, qui lui a légué des biens-fonds d'une valeur considérable, a été de fait fondée en 1811, quoique sa charte ne date que de 1827. Elle est protestante, mais sans distinction de secte, et est administrée par douze directeurs nommés par l'Exécutif. Le Gouverneur-Général en est visiteur *ex-officio*. Un "High school," une école des sciences appliquées aux arts, une école normale et ses écoles modèles annexes dépendent de cette institution qui, depuis sa fondation, a rendu d'immenses services à la cause de l'instruction supérieure. Les cours sont de quatre ans pour la médecine, les arts et les sciences appliquées aux arts, et de trois ans pour l'étude du droit. Elle est dirigée par 50 professeurs dont quelques-uns sont d'origine française.

L'université de Lennoxville ou "Bishop's College," située près de Sherbrooke, fut fondée en 1843 par l'évêque anglican de Québec, le très révérend Dr Mountain, mais sa charte ne lui a été octroyée qu'en 1852. Dans cette institution, qui est dirigée par 31 professeurs, on enseigne la théologie, les arts, le droit et la médecine. Le cours d'étude est de deux ans pour la première de ces matières et de trois ans pour chacune des trois autres.

* Plus 1 docteur en droit canon, 3 docteurs ès-lettres et 8 bacheliers-ès-sciences.

Un "High school" où le cours d'études dure cinq ans, dépend de cette université.

Le tableau qui suit donne le nombre des étudiants qui ont suivi les cours de ces deux universités et le nombre des diplômes qu'elles ont décernés pour l'année 1882-83.

	ÉTUDIANTS			DIPLOMES		
	McGill	Lennox-ville	Total	McGill	Lennox-ville	Total
Théologie.....	.....	6	6	.....	1	1
Droits.....	40	10	50	14	4	18
Médecine.....	188	52	240	30	4	34
Arts.....	143	17	160	26	13	39
Sciences.....	54	.....	54	4	.....	4
Total.....	425	85	510	74	22	96

L'université Victoria de Montréal où on enseigne exclusivement la médecine et la chirurgie est affiliée à l'Université Victoria de Cobourg (Ontario). Les cours s'y donnent en français, elle comptait 15 professeurs et 137 étudiants pendant l'année scolaire 1882-83 à la fin de laquelle elle a délivré 4 diplômes de maître en chirurgie, et 43 diplômes de docteur en médecine.

2. INSTRUCTION SECONDAIRE.—La deuxième division comprend : 1° les collèges classiques et industriels, 2° les académies.

Les collèges classiques sont au nombre de 23 : 17 catholiques et 6 protestants.

Les premiers sont ceux de l'Assomption, Bourget (Rigaud), Chicoutimi, Joliette, Lévis, Montréal, Nicolet, Québec, Sainte-Anne Lapocatière, Saint-Germain de Rimouski, Saint-Hyacinthe, Saint-Laurent, Sainte-Marie (Jésuites à Montréal), Sainte-Marie de Monnoir, Sainte-Thérèse, Sherbrooke et Trois-Rivières ;

Et les seconds, qui sont tous affiliés à l'Université McGill, sont : les collèges Presbytérien, Wesleyan, Anglican et Congrégationnaliste (Montréal), Morrin (Québec) et Saint-Francis (Richmond).

Dans toutes ces institutions, à l'exception des collèges Morin et Saint-Francis, la théologie est presque exclusivement enseignée.

En 1883, les collèges classiques avaient collectivement 4,285 élèves : 4,126 catholiques et 159 protestants. On y comptait 421 professeurs.

Il y a 11 *collèges industriels*, savoir: les collèges industriels de Arthabaskaville, Dufresne (Montmagny), L'Islet, Longueuil, Saint-Césaire, Saint-Jérôme, Trois-Rivières, Varennes, Sainte-Marie (Beauce), Chambly et West Farnham.

Ces collèges étaient fréquentés par 2,382 élèves: 2,366 catholiques et 16 protestants; le tout divisé entre 541 pensionnaires, 358 demi-pensionnaires et 1,483 externes, et dirigés par 86 professeurs, dont 71 ecclésiastiques et 15 laïques.

Les académies se divisent en académies mixtes,* académies de garçons et académies de filles. Elles sont au nombre de 246, savoir: 58 académies de garçons fréquentés par 11,244 élèves; 148 académies de filles donnant 22,991 élèves (sans compter un certain nombre de communautés religieuses indépendantes); et 40 académies mixtes, (garçons et filles) avec 4,043 élèves.

La division s'en fait comme suit:

ACADÉMIES * *		Nombre d'écoles	Garçons	Filles	Total
Sous contrôle des commis- aires catholiques	Garçons .	40	9,427	.....	9,427
	Filles....	50	.....	10,509	10,509
	Mixtes..	8	.....	.....	1,339
Sous contrôle des commis- saires protestants	Garçons .	2	407	.....	407
	Filles....	2	.....	228	228
	Mixtes..	12	.....	.....	1,110
Sous contrôle des syndics catholiques.....	Garçons .	.....	.....	.....	.....
	Filles....	.....	.....	.....	.....
	Mixtes..	.....	.....	.....	.....
Sous contrôle des syndics protestants.	Garçons .	2	136	.....	136
	Filles....	.....	.....	.....	.....
	Mixtes..	5	.....	.....	329
Académies indépendantes catholiques.....	Garçons..	12	1,252	.....	1,252
	Filles....	94	.....	12,135	12,135
	Mixtes..	2	.....	.....	388
Académies indépendantes protestantes.....	Garçons .	2	22	.....	22
	Filles....	2	.....	119	119
	Mixtes..	13	.....	.....	877
Totaux		246	11,244	22,991	38,278

* Les académies mixtes sont composées de garçons et de filles.

** Sous ce titre sont aussi compris les high schools.

Les académies mixtes et les académies de garçons comptent collectivement 185 professeurs, savoir: 77 instituteurs ecclésiastiques et religieux et 53 laïques, et 55 institutrices laïques et religieuses.

Les académies de filles sont dirigées par 730 religieuses, et 26 institutrices laïques. Un assez grand nombre d'académies de garçons sont aussi sous le contrôle de religieux, parmi lesquels viennent en premier ordre les frères de la Doctrine Chrétienne. Dans les premières, pas moins de 11 comptent de 500 à 1100 élèves, et parmi les secondes, 6 sont fréquentés par plus de 300 élèves.

Parmi ces institutions (dont la liste serait trop longue à énumérer) nous devons citer, comme venant au premier rang des académies catholiques, l'école commerciale du Plateau, à Montréal, à laquelle sont attachées une école polytechnique, et une école des sciences appliquées aux arts. Ce magnifique établissement qui n'a pas coûté moins de \$84,279 est sous l'habile direction de M. U. E. Archambault, qui a représenté avec tant d'intelligence le département de l'Instruction Publique de la province de Québec à la dernière exposition universelle de Paris et de 12 professeurs. Elle était fréquentée, en 1883-84, par 412 élèves. Cette maison et plusieurs autres bâties depuis quelques années par les commissaires d'écoles de Montréal, sont d'élégantes et riches constructions qui dénotent autant de bon goût que de zèle de la part de ceux qui dirigent l'Instruction publique dans cette grande cité.

Puis, parmi les *high schools* protestantes qui sont pour la plupart dirigés par des professeurs distingués, et où on reçoit l'éducation la plus soignée, on remarque plus particulièrement à Montréal — celle des garçons, 17 professeurs et 388 élèves; et celle des filles, 15 professeurs et 236 élèves. A Québec — celle des garçons, 5 professeurs et 100 élèves; et celle des filles, 7 professeurs et 110 élèves.

3. INSTRUCTION PRIMAIRE.—Les écoles primaires se divisent en deux sections: les écoles primaires supérieures ou écoles modèles et les écoles élémentaires. La première section comprend les écoles modèles mixtes de garçons et de filles, et les écoles modèles dissidentes et indépendantes, appartenant à l'une ou l'autre des trois catégories; et la seconde les écoles élémentaires, sous contrôle des commissaires, les dissidentes et les indépendantes.

Les écoles modèles sont au nombre de 333 (293 catholiques et 40 protestantes) et sont dirigées par 1,164 instituteurs ou institutrices, savoir: 271 professeurs ou instituteurs, dont 114 sont ecclésiastiques ou appartenant à différents ordres religieux, et 157 sont laïques, et par 893 institutrices, dont 592 religieuses et 301 laïques.

Quant aux élèves, au nombre de 26,378 (23,844 catholiques et 2,534 protestants) qui fréquentent ces différentes écoles, ils se répartissent comme suit, dans chacune d'elles :

ÉCOLES MODÈLES	Nombre d'écoles	Garçons	Filles	Total
Sous contrôle des commissaires catholiques.....	Garçons . 89 Filles 36 Mixtes*.. 138	7,438	3,280	11,076
Sous contrôle des commissaires protestants.....	Garçons Filles 2 Mixtes .. 21	.....	163	1,158
Sous contrôle des syndics catholiques	Garçons . 2 Filles 1 Mixtes... 2	272	41	93
Sous contrôle des syndics protestants.....	Garçons Filles Mixtes... 10	.....	.....	675
Ecoles indépendantes catholiques.....	Garçons . 4 Filles 16 Mixtes... 5	472	932	240
Ecoles indépendantes protestantes.....	Garçons . 1 Filles 3 Mixtes... 3	173	273	92
Totaux.....	333	8,355	4,689	26,378

Celles de ces écoles qui sont sous le contrôle des commissaires ou des syndics d'écoles reçoivent une allocation sur le fonds de l'Education supérieure, si elles sont en règle avec les prescriptions des lois scolaires qui les concernent.

* Signifie école composée de garçons et de filles.

Les écoles élémentaires sont au nombre de 4,404, fréquentées par 170,858 élèves divisés comme le fait voir le tableau suivant :

ÉCOLES ÉLÉMENTAIRES	Nombre d'écoles	Garçons	Filles	TOTAL
Ecoles catholiques sous contrôle.... } des commissaires.... }	3,042 } 86 }	62,887	64,473	127,360
Ecoles protestantes sous contrôle..... } des commissaires.... }	476 } 175 }	9,984	9,938	19,922
Ecoles mixtes (catholiques et protestantes) sous contrôle..... } des syndics..... }	396 } 29 }	2,564	2,987	13,185
Ecoles catholiques..... } indépendantes..... }	148	5,325	4,633	9,958
Ecoles protestantes..... } indépendantes..... }	34	443	374	817
Ecoles mixtes (catholiques et protestantes)..... } indépendantes..... }	18	36	22	916
Totaux.....	4,404	85,552	85,926	171,458

4. LES ÉCOLES SPÉCIALES comprennent : deux écoles des sciences appliquées aux arts, l'une dépendant de l'établissement du Plateau, est connue sous le nom d'Ecole polytechnique, l'autre attachée à l'université McGill. Elles ont à elles deux 17 professeurs et 179 élèves ;

Douze écoles des arts et manufactures, sous le contrôle du Conseil des arts et manufactures, comptant collectivement 26 professeurs et 734 élèves ;

Un institut des aveugles, fondé, à Montréal, par le révérend M. Rousselot, et placé sous la surveillance des sœurs de Charité, avec 7 professeurs et 41 élèves (11 garçons et 30 filles) ;

Deux instituts de sourds-muets, établis à Montréal : l'un pour les garçons et l'autre pour les filles ; le premier dirigé par les frères de Saint-Viateur, (23 professeurs et 152 élèves), et le second par les sœurs de la Providence (29 professeurs et 217 élèves) ;

Un institut de sourds-muets protestants, fondé par M. McKay, à Montréal, (5 professeurs et 39 élèves).

5. LES ÉCOLES NORMALES, établies en 1857, sont au nombre de trois : l'école normale Laval, à Québec, et les écoles normales Jacques Cartier et McGill, à Montréal. Les deux premières sont catholiques et françaises, et la troisième anglaise et protestante sans distinction de secte.

Les écoles normales Laval et Jacques Cartier ont des pensionnats où le prix d'admission est très minime et pour lesquels on accorde un certain nombre de bourses et de demi bourses tous les ans. Les jeunes gens qui se font admettre dans ces institutions s'engagent à enseigner au moins pendant trois ans après leur sortie de l'école, sous peine d'une amende de \$40.00 et du remboursement du surplus du prix de la pension dont ils auront ainsi profité, en cas d'inexécution de leur engagement. Les brevets qu'elles donnent aux élèves sortants sont divisés en trois catégories : *Académie, école modèle et école élémentaire.*

L'école normale Laval comprend deux pensionnats, l'un pour les garçons, l'autre pour les filles. Le premier est sous la direction immédiate du principal de cette institution, et le second est confié aux soins des religieuses Ursulines. A chacun de ces pensionnats est attachée une école modèle annexe.

Pendant l'année scolaire 1882-83, l'école normale des garçons avait 10 professeurs, dont 8 laïques et 2 ecclésiastiques, et 46 élèves, dont 9 externes, sur lesquels 36 ont obtenu des brevets de capacité, (8 d'académie, 15 d'école modèle et 15 d'école élémentaire). L'école normale des filles qui comptait 62 élèves, toutes internes, dont 49 ont eu des diplômes, (26 d'école modèle et 23

d'école élémentaire), était dirigée par 16 professeurs sur lesquels il y avait 12 religieuses, dont quelques-unes faisaient la classe aux 320 élèves (115 garçons et 205 filles), de l'école modèle annexe.

L'école normale Jacques Cartier a les mêmes règlements que l'école normale Laval, de Québec. En 1882-83 elle comptait 9 professeurs dont 2 ecclésiastiques, et 62 élèves. Seize diplômes y furent décernés, savoir : 6 d'académie, 7 d'école modèle et 3 d'école élémentaire. L'école modèle annexe était fréquentée par 302 élèves.

L'école normale McGill dépend de l'université de ce nom. Elle est mixte et les cours y sont de trois ans. Pendant l'année scolaire 1882-83, il y avait 9 professeurs et 136 élèves, (12 garçons et 124 filles), dont 86 ont obtenu des diplômes, savoir : 9 d'académie, 31 d'école modèle et 46 d'école élémentaire. Tous les élèves de cette institution sont externes.

Toutes les écoles normales avaient collectivement 34 professeurs des deux sexes et 298 élèves. Elles ont accordé 189 diplômes pendant l'année scolaire 1882-83.

Classes des brevets.	Jacques Cartier.	McGill.			Laval.			Nombre d'élèves Instituteurs.	Nombre d'élèves Institutrices.	GRAND TOTAL.
	Elèves Instituteurs.	Elèves Instituteurs.	Elèves Institutrices.	Total.	Elèves Instituteurs.	Elèves Institutrices.	Total.			
Académie	89	51	77	128	87	....	87	227	77	304
Ecole-Modèle.	229	90	409	449	253	456	709	572	865	1437
Ecole-Elémentaire....	160	45	921	966	229	461	790	434	1482	1916
Totaux.....	478	186	1407	1543	569	917	1586	1233	2424	3657

Ces institutions ont servi jusqu'ici de pépinières à la partie laïque du corps enseignant. Les personnes recommandables qui sont à la tête de ces établissements, sont une sécurité pour ceux qui pourraient craindre les effets de l'éducation laïque, telle

qu'elle est entendue dans certains pays. Aussi, les instituteurs et les institutrices qui en sortent, donnent-ils des garanties aussi complètes que possible tant pour la science pédagogique que pour les principes de saine morale qu'on leur a inculqués.

Le tableau ci-après donne le nombre et la qualité des diplômes qui ont été accordés aux élèves des trois écoles normales depuis leur fondation.

INSTITUTEURS.—Les personnes des deux sexes qui, dans la province de Québec, se vouaient à l'enseignement pendant l'année 1882-83 étaient au nombre de 6,644, savoir :

1,050 instituteurs dont 553 appartenaient à des ordres religieux, et parmi les laïques 432 avaient des diplômes de différents degrés, et 65 n'en avaient pas ;

Et 5,594 institutrices, savoir : 1,146 religieuses, 3,945 laïques diplômées et 503 laïques non diplômées.

La répartition s'en faisait comme suit, dans les villes et les campagnes :

VILLES.				CAMPAGNES.			
Instituteurs.		Institutrices.		Instituteurs.		Institutrices.	
Religieux.	Laïques.	Religieux.	Laïques.	Religieux.	Laïques.	Religieux.	Laïques.
317	178	516	365	336	319	630	4,083

Le corps enseignant est peu rémunéré dans la province de Québec ; aussi trouvons-nous que sur les 319 instituteurs laïques de la campagne, 96 ont un salaire de moins de \$200.00 par an et 55 seulement ont plus de \$400.00, de même que sur les 4,083 institutrices laïques de la campagne 1,793 n'ont pas \$100.00 et 129 seulement reçoivent plus de \$200.00.

Quoique dans les villes les traitements des instituteurs et des institutrices soient nécessairement un peu plus élevés, il n'est pas suffisant, en règle générale, pour reconnaître les services que rendent à la société les personnes qui se dévouent à l'éducation de la jeunesse.

ÉTAT GÉNÉRAL.—Le tableau suivant donne pour l'année scolaire 1882-83, le chiffre exact des maisons d'éducation et écoles,

et des élèves qui les fréquentent, pour chacune des divisions qui constituent le système scolaire de la province de Québec :

INSTITUTIONS.	Nombre des institutions.	Nombre des Elèves.
Universités.....	4	1,245
Collèges classiques.....	23	4,285
Collèges industriels.....	11	2,382
Ecoles normales.....	3	306
Ecoles spéciales.....	18	1,302
Académies.....	246	38,278
Ecoles modèles.....	333	26,378
Ecoles élémentaires.....	4,386	170,858
Totaux.....	5,024	245,034

Le montant payé tant par le gouvernement que par les contribuables pour les fins de l'éducation, pendant l'année scolaire 1882-83, a été de \$3,162,416, dont \$352,677 ont été fournies par le gouvernement. La population de la province de Québec étant, d'après le dernier recensement, de 1,359,027 âmes, il y aurait ainsi, en moyenne *un* élève par environ *cinq* habitants et *demi*.

IV. ÉTAT COMPARATIF.

Nous pensons ne pouvoir mieux résumer l'exposé que nous venons de faire de l'état de l'Instruction publique dans la province de Québec, qu'en donnant les chiffres suivants :

PROVINCES.	Population.	Nombre d'élèves.	Nombre d'institutions.
Québec.....	1,359,027	245,034	5,024
Ontario.....	1,923,228	484,985	5,313
Nouveau-Brunswick.....	321,233	66,775	1,447
Nouvelle-Ecosse.....	440,572	98,307	1,910
Ile du Prince-Edouard.....	108,891	21,495	473
Manitoba.....	65,954	6,796	164
Colombie Anglaise.....	49,459	2,693	48
Totaux.....	4,268,364	926,085	14,379

Ce tableau, dans lequel nous avons mis le chiffre de la population du recensement de 1881, en regard du nombre des institutions scolaires et des élèves des différentes provinces, donne, comme on le voit, une moyenne générale assez satisfaisante.

THE END.

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